Col. B. L. Milburn

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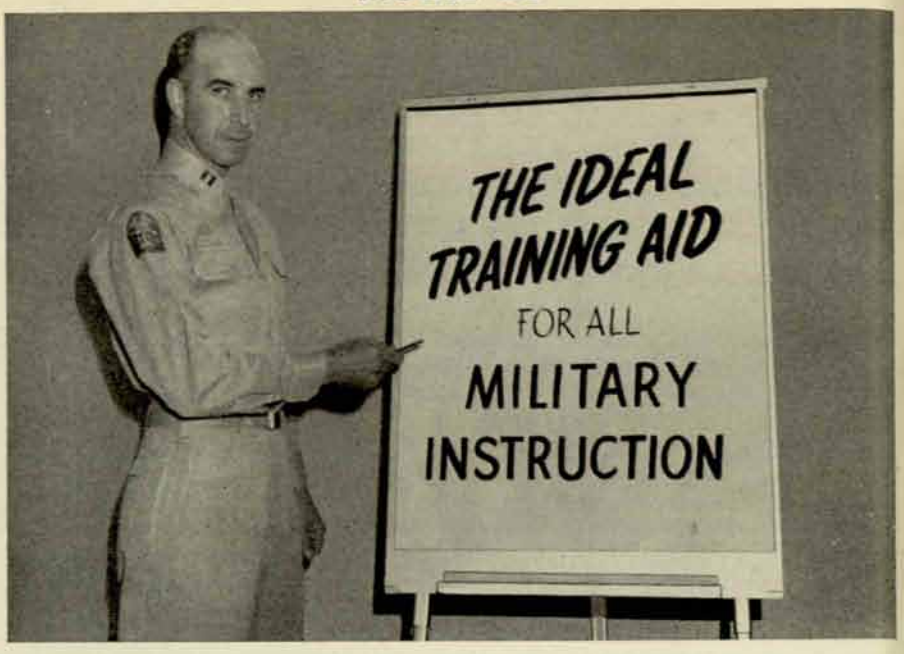

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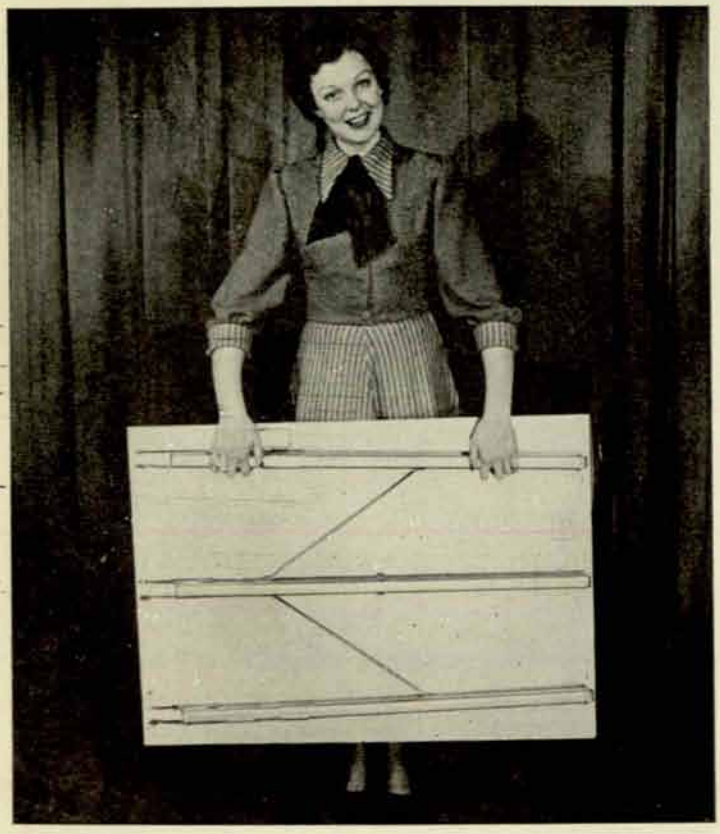

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Analysis of Automatic W

By Captain Ha

All present-day AW sighting devices are so constructed that the lead angles generated do not produce round-for-round accuracy. Although this is a handicap, the tactical advantages gained (such as lightness in weight, ruggedness, and ease in training) outweigh the disadvantages. This handicap can be manifestly overcome if it is known at what point or points along a particular course the sight will be accurate, and for how long. Proper use of present devices is based on a knowledge of these course characteristics. The solution of the fire control problem can be approached more closely if certain rules can be formulated for the use of each sight that will increase the time interval during which a sight will be accurate. A thorough understanding of the so-called "slant plane" lead requirements provides the foundation for complete mastery of AW gunnery and facilitates the solution of the fire control problem.

The Slant Plane Approach

For the past several years the solution to the AW problem has been approached by use of the "Slant Plane Concept," whereby the problem is isolated in one plane, the slant plane. (The "slant plane" may be defined as one which contains the gun and the course of the target during the projectile's time of flight.) The use of this approach requires the determination of only one lead angle and reduces the problem to two dimensions. See Figure 1. This lead angle is called the "required" lead angle. By computation, required slant plane lead angles may be determined for a series of points along a given course thus producing a required lead curve against which leads produced by any sight for the same course may be compared. Information obtained from such a comparison supplies a basis for proper operation of the sight to produce the optimum in accuracy. Let us determine the factors which affect the magnitude and variation of required leads.

The Required Lead Equation

The lead angle necessary for a hit on a given target at a given point on a course is known as the "required lead angle," ΔR, whereas the "generated lead angle," ΔG, is the lead angle actually produced by the sighting devices. In order to isolate the factors which influence the required lead so that their individual effects may easily be analyzed, the required lead equation is evolved from the basic slant plane triangle.

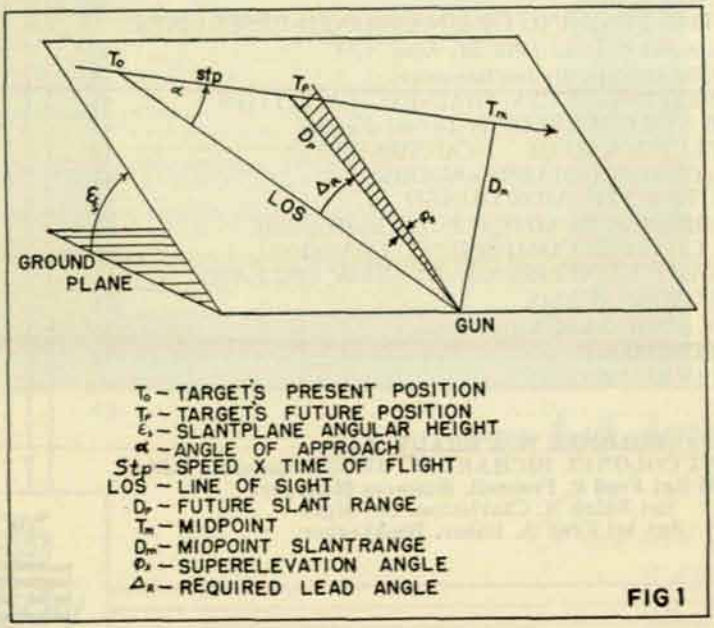
From the law of sines:

$$\frac{\sin \Delta R}{Stp} = \frac{\sin \propto}{Dp}$$

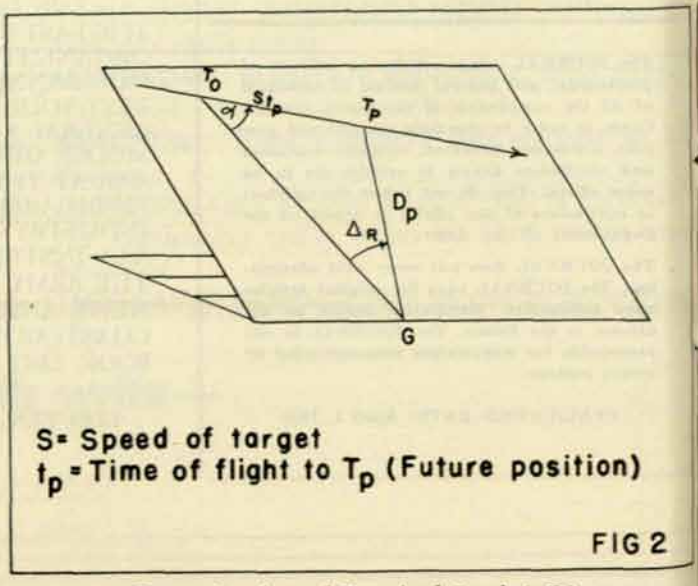
$$\text{or } \sin \Delta R = \frac{Stp \sin \propto}{Dp}$$

$$\text{or } \sin \Delta R = \frac{St_p}{D_p} \sin \propto,$$

whereupon it may be seen that the magnitude of the required lead depends upon the speed of the target, the time



Elements of the AW Problem



Determination of Required Lead (ΔR)

apons Lead Requirements

Broudy, CAC

of flight-future slant range relationship, and the sine of the angle of approach.

Analysis of Factors

Speed of the Target. By temporarily holding the $\frac{t_p}{D_p}$ factor and sin $\propto$ constant, and varying speed, it can be seen that if speed is doubled the magnitude of the required lead is doubled in value. Thus, the magnitude of the required lead varies directly with target speed.

Time of Flight—Future Slant Range Relationship ($\frac{t_p}{D_p}$ factor). Since all present AW weapons have relatively high muzzle velocities the time of flight-range relationship will be almost a constant within the effective ranges of the sighting devices. For example, three representative ranges are selected that are within the effective ranges of the sights; corresponding times of flight are then extracted from the appropriate firing tables and the $\frac{t_p}{D_p}$ factors are compared:

Dp (yds)	tp (secs)	$\frac{tp}{Dp}$
500	.58	.00116
1000	1.23	.00123
1500	1.98	.00132

Between 500 yards and 1000 yards the difference is only .00007. Between 1000 and 1500 yards the difference is only .00009. Between 500 yards (a medium range) and 1500 yards (close to the maximum effective range of AW) the total difference is only .00016. Let us see what effect these small differences will have on the magnitude of the required lead. By selecting a speed of 400 mph (200 yds/sec) and comparing future ranges of 500 yds and 1,500 yds, the lead required at midpoint can be computed.

For a future range of 500 yds, $\Delta R = 238$ mils.

For a future range of 1500 yds. $\Delta R = 272$ mils.

The difference between the two required lead angles is only 34 mils in 1000 yards of range change or an average of only 3.4 mils per 100 yards of range change at midpoint for this target. Since the effect of the $\frac{t_p}{D_p}$ factor on the required lead is so slight it was considered to be a constant in the design of two AW sights; the speed ring sights and present AW computing sights. This permitted the construction of these sights to be simple, light and rugged, with the sacrifice of only a small degree of accuracy.

Sin $\propto$. Since the angle of approach is always measured between G-T_o-T_p it will characteristically be an acute angle on the approaching leg, a right angle at midpoint and an obtuse angle on the receding leg, or theoretically, varying from 0° to 180°. However, in the required lead equation we must deal with *sin* $\propto$. Consider the following values of the sine function:

$$\sin 0° = 0$$
$$\sin 90° = 1$$
$$\sin 180° = 0$$

Thus the effect of sin $\propto$ causes the required lead to be a small angle far out on the approaching leg, which increases to maximum at midpoint and then decreases on the receding leg. Therefore, the magnitude of the required lead varies directly with the sine of the angle of approach.

Now that the factors making up required lead have been determined and analyzed, let us see how we can use the required lead equation as a tool in facilitating better use of our sights.

Required Lead Curves

By assuming target speed and Dm, a graphical representation of the lead required throughout the course may be determined by substituting in the required lead equation selected values of Dp. The values obtained are normally plotted using as arguments lead in mils for the ordinate and time (in seconds) for the target to fly from T_o to T_m as the abscissa. This computation will result in a required lead curve for a point target. Using the target's center of mass as a reference when the target is at T_o, ΔR will be measured

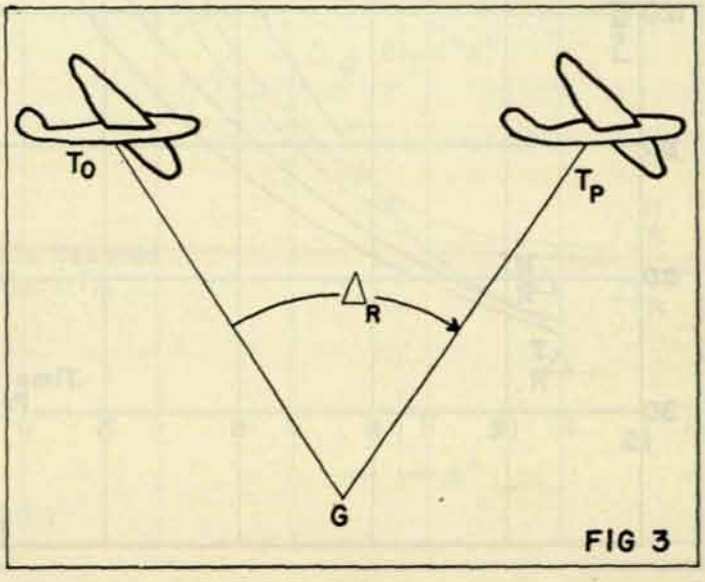


FIG 3

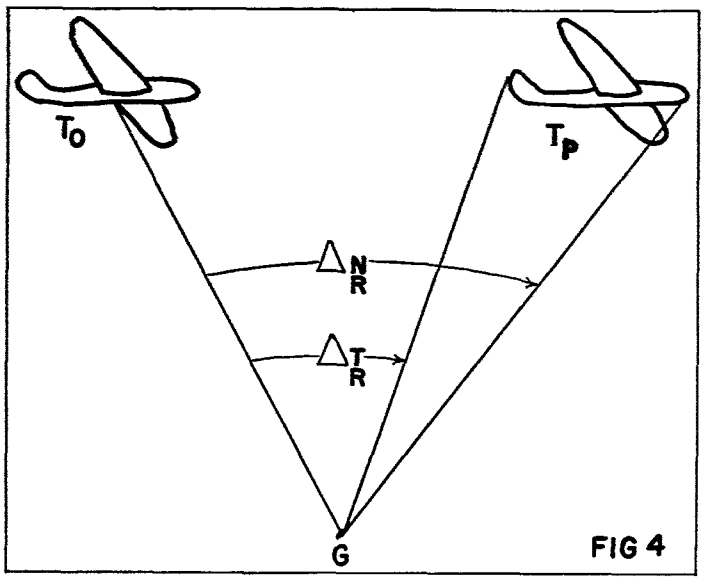


FIG 4

to the same point of the target at Tp. See Figure 3. However, a hit any place along the target's fuselage between its nose and tail could result in a kill. This gives rise to two required lead angles: the lead required to hit the nose of the target, Δ^N_R, and the lead required to hit the tail of the target, Δ^T_R. See Figure 4.

Figure 5 is a typical required lead graph for a given set of conditions.

If, for all points along the course, there are two lead angles which would produce hits, it is evident that an aim tolerance exists.

Aim Tolerances

The area between Δ^N_R and Δ^T_R in Figure 5 is the "along course aim tolerance" afforded by the length of the target. By definition, the along course aim tolerance is one-half the angle subtended at the gun by the length of the target.

The actual magnitude of the along course aim tolerance is affected by three factors:

a. *The length of the target.* If the target's fuselage is longer or shorter than the 16 yard length used in the computations the aim tolerance will become greater or smaller respectively.

b. *The slant range to the target.* The along course aim tolerance angle of a 16 yard target at 1000 yds slant range is 8 mils at Tm (by definition). The same target at 2000 yds slant range will allow an along course aim tolerance of 4 mils (at Tm).

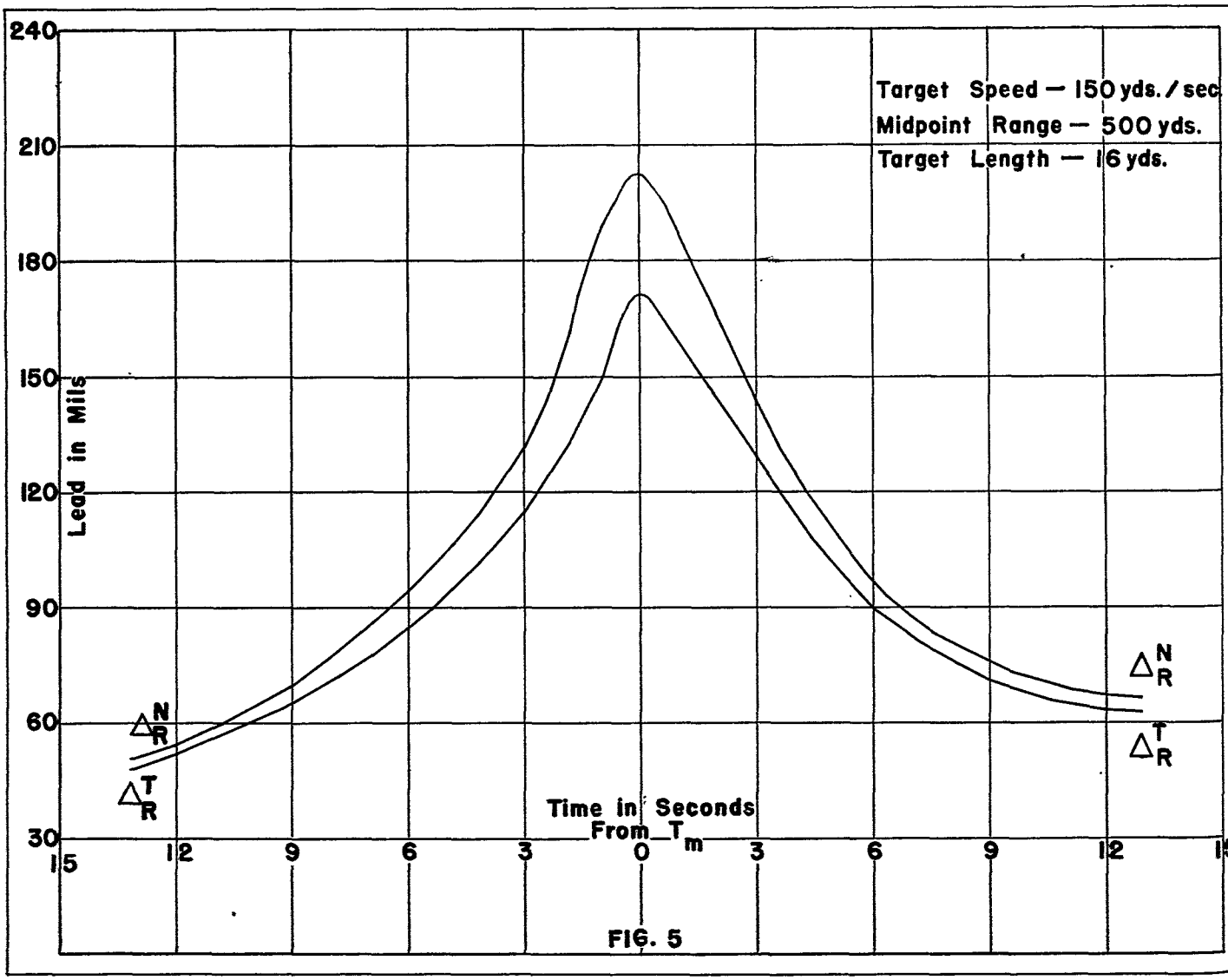
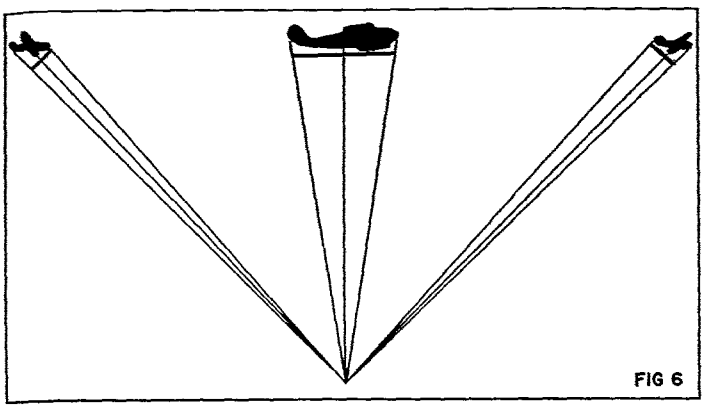


FIG. 5



The Effect of Range and Angle of Approach on the Along Course Aim Tolerance Angle.

c. *Angle of approach.* At small angles of approach on the approaching leg of a course and at large angles of approach on the receding leg the target's fuselage appears foreshortened and the hitting area is decreased. See Figure 6.

In order to take advantage of the along course aim tolerance the target's center of mass must be used as the aiming point, regardless of the type of sighting device being used. Thus, if a generated lead angle is slightly larger or smaller than the lead necessary to hit the center of mass, a hit still might result.

Another aim tolerance exists due to the depth of the target. It is known as the across course aim tolerance. Although this tolerance concerns itself with elevation and not with slant plane lead requirements, its critical nature makes it worthy of mention. By definition, the across course aim tolerance is one-half the angle subtended at the gun by the depth of the target. In modern aircraft, the ratio of fuselage length to depth is about 7 or 8 to 1, therefore, a target whose length is 16 yds will have a depth of about 2 yds. The across course aim tolerance will always be in the neighborhood of 1 mil or less. Its magnitude is affected by the target's depth and the slant range of the target.

Analysis of the Lead Curves

By examining the lead graph in Figure 5 certain observation may be made:

a. *Aim tolerance variation.* (area between $\Delta \frac{N}{R}$ and $\Delta \frac{T}{R}$) The along course aim tolerance is small far out on the approaching leg and increases to midpoint, where it is at its greatest value, and then decreases in value on the receding leg.

b. *Rate of change of lead.* Lead increases slowly on the approaching leg until shortly before midpoint, where it increases rapidly. The point of greatest rate of change

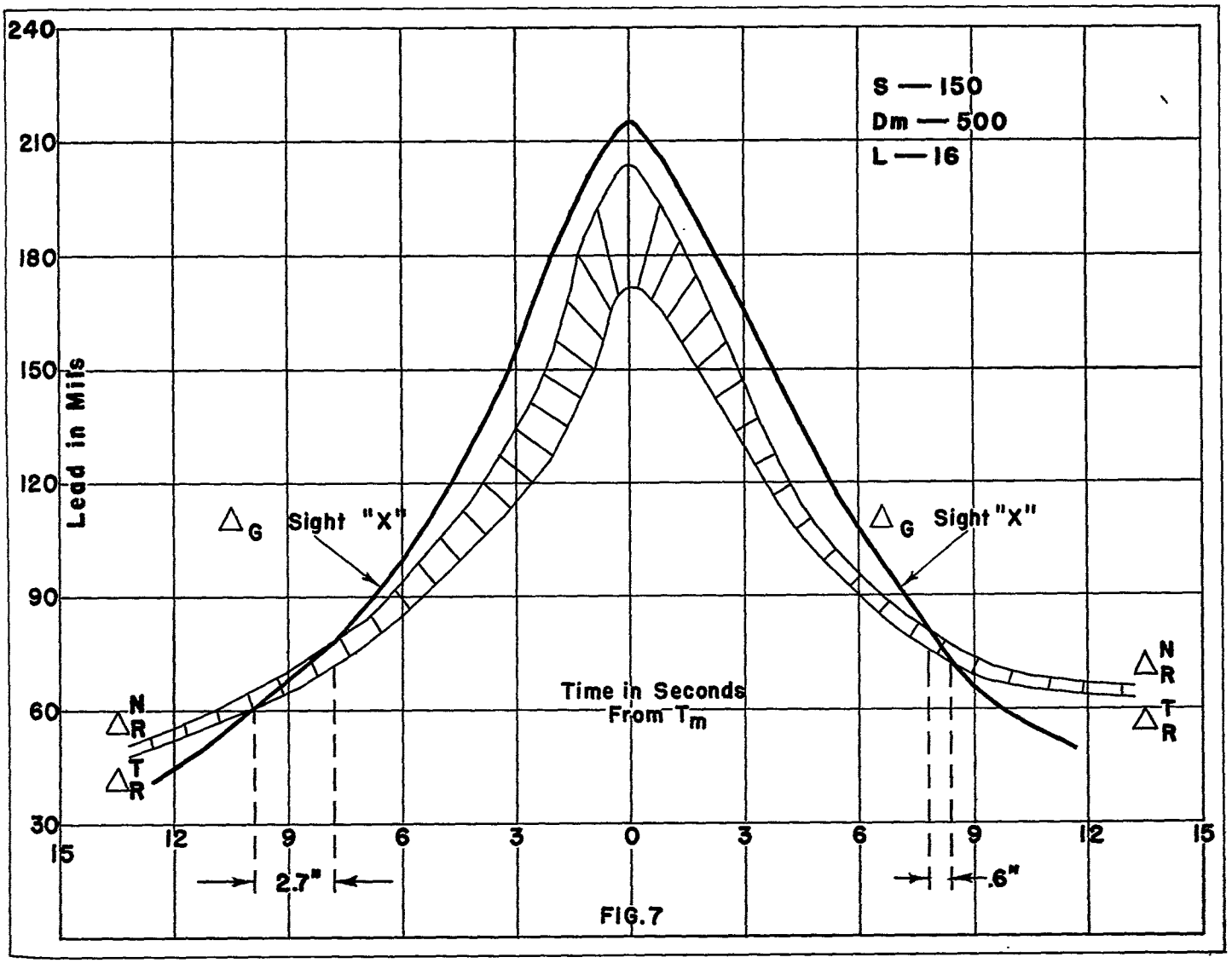


FIG.7

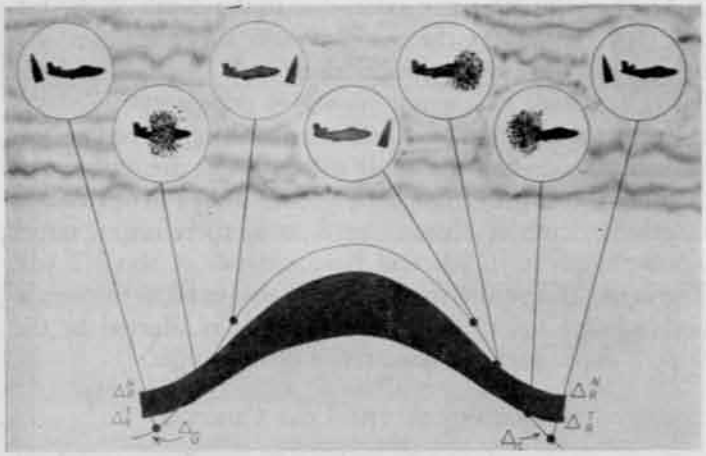


Figure 8.

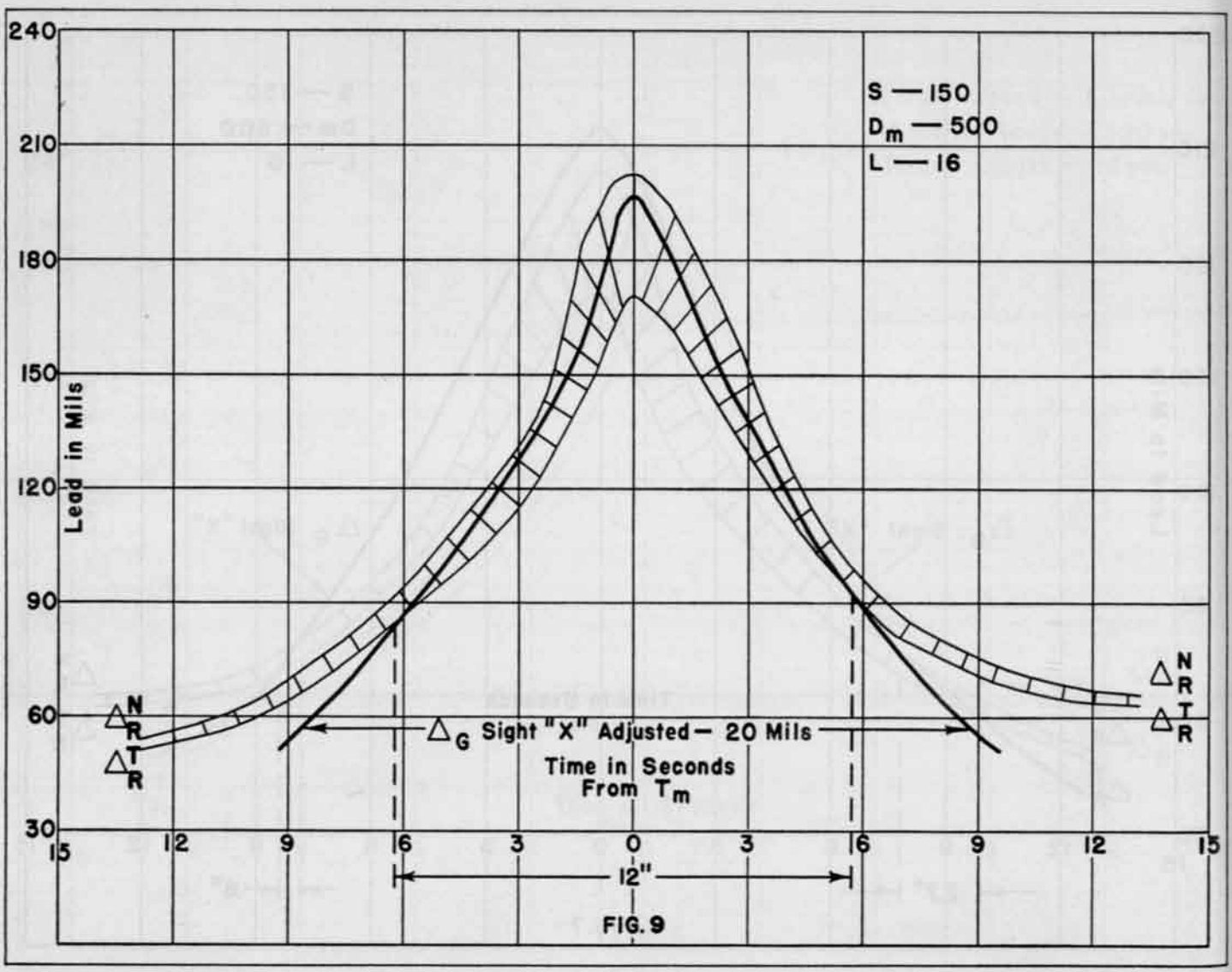
of lead is indicated by the steepness of the slope of the curves.

The Flythrough Principle

It is important to remember that the inherent inaccuracies in AW sights preclude round-for-round accurate lead data, but that this handicap can be overcome by the development of fire control rules that will cause lead data to be accurate longer for any particular course. Proper fire control rules may be formulated by application of the "flythrough principle." A flythrough occurs when the lead generated by a sighting device is equal to the lead required to hit the target. So far, we have set up the foundation of the flythrough principle—the required lead. Since we know the basis of construction of the various sights, the generated lead may be computed and compared graphically with the required lead for the same target. Such a comparison can be of inestimable value in determining how the sight can best be used. To illustrate this principle the generated lead of an imaginary sighting device, Sight "X," is compared to the required lead for a particular target. See Figure 7.

At those places along course where Δ G Sight "X" is equal to Δ R, the target is passing through the cone of fire; that is, a flythrough is occurring. In the above illustrations, the flythrough time interval for the whole course is only 3.3 seconds. If this sight is being used with the 40mm gun (maximum rate of fire—120 rpm) only 5 rounds will leave the gun with the correct lead. Figure 8 illustrates the appearance of the projectiles in the sky for Sight "X."

For given values of S and Dm the shape of the generated lead curve may not be changed. However, by initially altering input data, depending upon the construction of the sight, the generated lead curve may be moved up or down with respect to the required lead curve. In the case



of Sight "X" it can be seen that it is generally overcomputing but that slope of Δ G follows that of Δ R fairly consistently. Let us assume that Sight "X" is provided with a spot correction mechanism. If, before firing, a -20 mil spot were applied, the flythrough time interval would be increased considerably—to 12 seconds. See Figure 9.

The number of rounds leaving the 40mm gun barrel with correct lead has been increased from 5 to 24 practically assuring hits with a trained crew.

Summary

In present AW sighting device design a compromise with accuracy was tolerated in order to obtain sights that would provide instantaneous data, lightness in weight, and simplicity in use. Although inherent inaccuracies exist, the efficiency of each sight can be improved by proper adjustment based on application of the flythrough principle and its foundation, the required lead.

In addition to providing the basis for the analyzation of fire control devices, the required lead assists in the clarification of the AW gunnery problem. It may also be used to compare the efficiency of two or more sights and in the evaluation of future devices that are not in the round-for-round accurate class.

The rules for adjustment for the Director M5A3, speed ring and computing sights will be discussed in future articles by various members of the AW Section, Gunnery Department, AA & GM Br, TAS.

Training Group Replaces Guided Missile Regiment at Fort Bliss

Establishment of a guided missile training group at Fort Bliss, Texas, in connection with the use of guided missiles as operational weapons was announced by the Department of the Army.

The creation of an Army training group places guided missile training under control of the Army Field Forces. It will provide a program designed to assure the Department of the Army of a high standard of training among individuals and units in the guided missile field.

The training group will consist of three battalion-size units which will conduct simultaneous and successive phases of training as follows:

The first battalion will be composed of highly trained personnel now available to the Army Field Forces. Its mission will be to develop cadre for the units of the third battalion which will conduct the service-testing of experimental guided missile weapons. The most highly trained guided missile specialists will come from the first battalion.

The second battalion, formed and trained simultaneously with the first battalion, will be composed of personnel who, for the most part, have no previous training in guided missile work. The battalion's mission will be to conduct guided missile preliminary indoctrination and advanced individual training. Lesser specialists and guided missile training aids will be developed in this unit.

The third will be composed of personnel who have completed training in the first two battalions. Its mission will be threefold:

(1) To provide guided missile units to assist in the service-testing of guided missile weapons; (2) to develop Tables of Organization and Equipment for operational guided missile units; and, (3) to conduct unit training and develop guided missile tactical doctrines.

The over-all organization will be capable of rapid expansion.

The Army Field Forces has been engaged in guided missile activities since 1945, when the 1st Guided Missile Battalion was activated. About two years ago, it was seen that there was a need for further expansion and the 1st Guided Missile Regiment was activated, absorbing the 1st Guided Missile Battalion, and assuming its missions on an expanded scale. Under present plans, the group organization has been adopted to provide a more flexible structure on which operational units may be formed.

The 1st Guided Missile Regiment will be discontinued. The new group will compose personnel of the regiment.

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"Special Text AA & GM-1, An Introduction to Guided Missiles"—This text contains about 300 pages; it is illustrated with 151 drawings and photographs. The contents of the text includes the following: Atmosphere and Aerodynamics, Guided Missile Power Plants, Guiding Systems, Launching Methods, Lethal Devices, V-2, V-1, and The Employment of Guided Missiles. ($1.00 ea.) Restricted.

"Special Text AA & GM-2, Flak Analysis"—This text covers in general the same ground as the forthcoming TM 44-260 "Flak Analysis," but by using hypothetical data throughout the examples it has been possible to reduce the classification from Confidential to Restricted. (.50 ea.)

"Special Text AA & GM-3, Heavy Antiaircraft Gunnery and Fire Control"—This text contains the following: Gunnery-General, Firing Errors and Probabilities, Position Finding and Gunnery, Preparation of Fire, Analysis of Fire, Fire Control-General, and The Firing Battery. (.50 ea.) Restricted.

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OUR ANTIAIRCRAFT ARTILLERY HAS A BRIGHT FUTURE

By Colonel Donald J. Bailey, GSC (CAC)

One day in the Pentagon, when I was stationed there several years ago, I ran into two young lieutenant colonels of AAA I had served with during the war. During the course of our pleasant reminiscing over wartime duties together, their conversation turned to the future of our Branch. Both appeared to evidence lugubrious doubts about its destiny due to several personal observations. One was consternation about our Corps being able to survive the schisms existing then in its ranks and emerge as a strong, united, self-supporting entity. The other was that they felt AAA appeared to be drifting without a responsible head to guide it. They voiced the need for a Chief of Antiaircraft Artillery to fight for AAA's "place in the sun" behind whom we could rally and achieve unity of purpose. As for the schisms, they cited the then vocal group of officers which insisted that AAA, as part of the "Air Defense Team" must cast its lot with the Army Air Corps; and another group, fearing we would lose our technical know-how if we joined up with the Field Artillery, wanted AAA to remain as a separate branch. They named a third group, which was the largest of the three, as the champions of one united Corps of Artillery. I told them that I personally had a great deal of faith in the future of Army AAA and knew that a large number of senior officers in responsible positions would insure that antiaircraft artillery receives full recognition for its great potentiality in any eventual war. Though I conceded that their cited examples of lack of harmony in our official family were then factual, I counseled them not to lose faith, but await developments. I predicted that AAA would have a magnificent future and that most, if not all of their qualms would disappear within a few years.

In the two and one-half years since that conversation, I have reason to believe that my prediction was, if anything, an underestimate. In my opinion, AAA has already achieved its "place in the sun" and its zenith is nowhere in sight on its upward surge. I feel secure in making a further prediction that our Antiaircraft Artillery is well on its way to becoming one of the several most important Arms in the Army within the next decade.

Proof of such an assertion may be found in many references and in public interest. Joint Chiefs of Staff decisions, Department of the Army studies, hearings before Congress, newspaper reports, articles in such compendious news weeklies as *Time* magazine and *Newsweek* and in Troop Information programs emphasize the threat to our national security of airborne attack, the means of defense against such attack and the growing importance of guided missiles. Our military planners and many of the American public appreciate the tremendously important role antiaircraft (both conventional weapons and guided missiles) will have in protecting the country from such attacks and in carrying the war against an aggressor. Any AAA officer who has recently made a speech to a Rotary Club or similar gathering of civilians will vouch for the intense interest of his audience in current AAA research, developments, and tactical employment, meager as such information has to be because of security classification. Few of us will contest that Congress, despite cutbacks in requested appropriations, has not seriously stinted AAA recommended development programs. Never before has antiaircraft artillery enjoyed the official and public support now shown. This interest is not seasonal or transitory. It will increase under the threat of atomic attack, enemy-launched guided missiles and other ramifications of the "cold war." But regardless of the duration of the cold war, the gaze of MARS hereafter will be more skyward and in this new art of warfare, antiaircraft artillery will play an ever-increasingly important, stellar role.

The aim of this article is to attempt to tell antiaircraft artillerymen "what goes on" in their Branch, to inspire "confidence in their bosses," and to make them feel that each AAA officer and soldier "has a vital part to play in fabricating the end product." Should such an endeavor be successful, the qualms of my two friends would be resolved, if any still exist in their minds. Of the above objectives, a brief summary of "what goes on" is the most important, and the most difficult to tell. It is important because if we know what the score is, all of us can man the oars and pull together. However, it is difficult, in an unclassified article, to give a complete summary of the past two years' classified decisions of the Department of the Army and Joint Chiefs of Staff affecting the policies, doctrines and procedures, as well as the future of AAA. Fortunately, however, some research has uncovered a number of unclassified documents which indicate the trend of official thinking and provide a lodestone for general guidance in such an endeavor. I refer to the Joint Army and Air Force Bulletin No. 13 of 13 May 1948, otherwise known as the "Functions Paper" or "Key West Agreements"; to the presentation of General J. Lawton Collins, Chief of Staff, U. S. Army, before the Committee on Armed Services, House of Representatives of Congress on 20 October 1949; to *Army Information Digest* articles; to various press releases and such books as Dr. Bush's *Modern Arms*

and Free Men; and to historical narratives and unclassified after-action reports of various units overseas, as well as unclassified research reports on enemy operations.

"Key West Agreements"

Since it is necessary to study these important agreements thoroughly to understand the future command and control relationships of AAA in the Army and with respect to the Air Force, this document is reviewed herewith at some length.

The National Security Act of 1947 created the Department of Defense and the three Departments of Army, Navy, and Air Force. In order to delineate the functions of the Armed Forces, the Joint Chiefs of Staff were directed to prepare a document thereon. This was accomplished at Key West, Florida, in May, 1948 and resulted in the "Key West Agreements" or "Functions Paper." Common and specific functions of the Armed Forces were prescribed.

Certain important restrictions were placed on the interpretation of the published functions. The first important one was that these functions were to serve merely *as guidance.* Another and equally important restriction was that *a merging* of the three Armed Forces was *in no way to be implied* by the functions. In paragraph 5 of the Agreements, it was stipulated that such variables as technological developments, variations in the availability of manpower and natural resources, changing economic conditions and changes in the world politico-military situation *may dictate the desirability of changes* in the present assignment of specific functions and responsibilities to the individual Services.

The overtone of the Functions Paper emphasizes jointly approved doctrines and *unified commands.* For those unfamiliar with the term "unified command," it can be illustrated by visualizing a functional diagram. At the top of the diagram is the unified command commander who may be selected from the Army, Navy or Air Force. Examples of this may be observed in our overseas garrisons,—for example, an Army general is the unified commander in the Caribbean Area; an Air Force general commands joint forces in Alaska; and a Navy admiral has commanded Army, Navy and Air Force units in the Pacific. Under the unified commander is a joint, integrated staff composed of members from all three Services who advise him on matters pertaining to the Service each represents. Then on the chart under the staff appear three parallel, independent command columns, the first of which represents the Army elements and units, the next the Navy units and the third column, the Air Force units. Each column is headed by the senior commander of that Service in the unified command. Thus it is evident that unified commands are ideal command structures for large military establishments, as well as subordinate commands above the size of field armies or army groups, because each Service operates in its own field of endeavor, under its own senior commander and chain of command, without merging, and all three Services cooperate to produce the maximum results under the unified commander. I emphasize this description of an unified command here because it is important in considering the command relationship of AAA. Also, it is wished to stress that the "Functions Paper" prescribed that doctrine involving more than one Service will be established jointly. Such procedure prevents one Service from dominating or dictating to another in developing doctrine, because each Service representative in the Joint Chiefs of Staff and in its several subordinate joint committees has an equal vote in such development.

Department of the Army primary functions include the mission of *defending land areas* (because AAA weapons are primarily defensive, this may be interpreted that AAA units overseas will be under Army command and control); organizing, training and equipping Army Antiaircraft Artillery units; providing Army forces as required for the defense of the United States against air attack *in accordance with joint doctrines and procedures approved by the Joint Chiefs of Staff;* formulate doctrines and procedures (*not* jointly) for the organization, equipping, training and employing of forces operating on land at division level and above, *including division, corps, armies and general reserve troops* (this is solely an Army job and recognizes that all Army units, including AAA, must be employed entirely under Army command and control at the command levels stated).

Under the Army "collateral functions" is introduced one of the several ambiguous directives which justify different interpretations by the Services as to the meaning of certain functions established in this guidance "Paper." As a *collateral function,* it assigns the Army the mission of "interdicting enemy sea and air power and communications through operations on or from land." It would seem from studying the Army's *primary functions* that interdicting enemy air power was one of the defensive missions on land areas. Due to various interpretations of the meaning of those functions which are confusing, the several subsidiary joint committees of the Joint Chiefs of Staff have endeavored to clarify such ambiguous passages, as well as formulate joint doctrine in other functions. Reference will be made again to these committees.

Another collateral Army function was "to provide forces and equipment for and to conduct controlled mine field operations." This function was canceled by President Truman and the job was turned over to the Navy on 19 May 1949. Thus it is evident that the provisions of paragraph 5 of the Key West Agreements are workable, and when it is seen that the agreements should be altered, it is not impossible to do so.

A primary function of the Navy is to provide sea-based air defense and the sea-based means for *coordinating control* for defense against air attack, *coordinating with* the other Services in matters of joint concern. Note that coordination is stressed in these functions involving missions with other Services. Command and control by another Service is not stated here, even though Navy units normally might be considered eligible for other Service control when they tie in with land-based air defense units during the time Naval vessels are in harbors.

Under the Air Force primary functions, is stated the mission: "to be responsible for defense of the United States against air attack in accordance with the policies and procedures of the Joint Chiefs of Staff"; and "to formulate joint doctrines and procedures in coordination with the other Services for the defense of the United States against air attack. . . ." Two other important Air Force primary functions.

from the viewpoint of AAA are: "to provide Air Force forces for land-based air defense, coordinating with the other Services in matters of joint concern" and "to develop, in coordination with the other Services, doctrines, procedures and equipment for air defense from land areas, including the continental United States."

With respect to its effect on Army AAA, the probable meaning of these functions, as originally published, may be summarized very briefly as follows: (1) In continental United States, the Air Force is assigned primary responsibility for air defense. Administrative functions for those AAA units assigned the mission of air defense of the United States will rest with the Army, but operational control over those units may be vested in the Air Force; (2) in overseas theaters of operation, command *as well as control* of AAA units assigned to field armies, corps and divisions will remain with those armies, corps and divisions, and in larger commands organized as unified commands (such as a Communications Zone), *command and control* of AAA units will remain in Army channels; (3) all doctrines affecting AAA in joint operations will be arrived at jointly; (4) coordination, unified commands and joint operations are the underlying note of these "Functions" as opposed to domination of one Service over units of another.

I would like to emphasize here that the method of control of AAA in the United States is important, of course, but even more important to the future of antiaircraft artillery is its command and control in overseas theaters of operation in any future war. It is quite likely that operations in the U. S. will be only transitory in preparation for our movement overseas. We would never win a war unless we carried it to the enemy.

It is not outside the realm of possibility that, even in continental United States, the "Functions Paper" eventually may be interpreted to provide for a unified command here. If such a command is established, then AAA units assigned to air defense missions in this country would be under an Army AAA commander and, as directed by the unified commander, would coordinate with the Air Force in discharging such missions. Coordination and mutual cooperation overseas in the last war worked extremely well between field army AAA units and tactical air commands supporting those field armies. There is no reason to doubt that coordination and cooperation, rather than operational control, would work equally well in air defense operations in this country.

General Collins' Presentation to Congress

During the recent Congressional investigation of the Navy-Air Force B-36 controversy, General Collins, Chief of Staff, U.S. Army was called before the Committee on Armed Services of the House of Representatives. The soundness of his enumerated points, his lucidity, his logic, and his masterful delivery greatly impressed his audience. An extract of pertinent passages of his speech will be enumerated here in order to: explain the purpose of the important "Key West Agreements"; indicate the position of the Department of the Army with respect to them; give the reader some insight into the functions and composition of the several higher joint committees under the Joint Chiefs of Staff; impress the reader that the Army senior planners stand solidly back of joint, rather than unilateral operations; and indicate future trends, as well as repetition of the fact that the "Functions" may be altered if circumstances so dictate. Quote:

"As you know, the National Security Act prescribes responsibilities for each of the Services. For the Army and Air Force, these are stated in broad general terms; for the Navy they are outlined in greater detail.

"After the passage of the National Security Act, it was considered necessary that a more detailed statement should be prepared by the Services themselves as a basis for planning. Accordingly, the Secretary of Defense—then Mr. Forrestal—and the Joint Chiefs of Staff met at Key West in March 1948 and drew up a statement, 'Functions of the Armed Forces,'—more commonly referred to as the Key West agreement or the 'Functions Paper.'

"The 'Functions Paper' represents an agreement among the Joint Chiefs of Staff approved by each of them. It was later approved by the President and promulgated by the Secretary of Defense. It was recognized that this document should be revised from time to time as experience might indicate. The provision for modification is a wise one, for you will agree, I am sure, that it would be most difficult for anyone to predict the changes which are likely to develop in the art of warfare as a result of new weapons, new techniques and scientific progress.

"About a year ago, the Joint Chiefs of Staff set up several joint committees consisting of equal members of representatives from all three Services to develop joint doctrines and procedures.

"I think it is appropriate at this point to tell you that, in general, Army members on a joint committee are not instructed as to the line of action they would follow in committee meetings.

"After considerable study, Army members of the committee we were discussing, came to the conclusion that certain changes were desirable in the 'Functions Paper.' Some of the proposed changes were purely editorial; others were changes in substance. One of the changes which the Army members recommended provided for the establishment of four types of joint centers, namely: Airborne, air tactical support, air defense and amphibious, under the Joint Chiefs of Staff. These would be charged with the development of joint doctrines, tactics, and techniques, joint training and joint testing of equipment.

"When the Army proposal for the changes in the 'Functions Paper' was considered by one of the senior joint committees, it was rejected by the Navy and Air Force members. And, gentlemen, I do not charge that there was any conspiracy—2 to 1 against the Army in this case. One member thought that it involved a transfer of responsibilities which were prescribed in the National Security Act. Another member objected to the proposal because he felt it violated the principle of primary responsibility.

". . . Our main object in recommending joint centers was to facilitate joint work in airborne operations, which in my judgment, still need a tremendous amount of study and development.

". . . It was a natural sequence that the joint center idea should include the other three installations I have already

named; that is, close tactical air support, amphibious operations and air defense.

"Whether we were right or wrong in making our proposal, the fact is that it was not accepted by the Navy and Air members of the appropriate committee. The subject will now be considered in due course by the operations deputies—Admiral Struble for the Navy, General Norstad for the Air Force and General Gruenther for the Army. It will then be studied by the Joint Chiefs of Staff. If the Navy and Air Force still do not favor the suggested changes in the 'Functions Paper,' it will be up to me as Chief of Staff of the Army, to decide whether or not I desire to have the matter presented to the Secretary of Defense, which I am entitled to do under the provisions of the Unification Act. Even he would not have the final decision, however, if he should decide to establish these centers, since it has been made clear that changes in roles and missions must have the approval of the President as Commander in Chief of all the Services. Surely this process is not a hasty one, nor is it a conspiracy. I believe it provides ample insurance that the will of Congress will not be thwarted."

The Air Defense Question

This polemical subject merits much thought and sober analysis without rancor. It must be solved jointly and fairly because there are good arguments for both sides of the question. However, it would be weak as well as unsound to meekly agree on disputable points merely for the sake of harmony. Yet resolution of its problems is vital because the entire command and control of antiaircraft artillery hinge on their solution. Extremists cannot effect such a resolution. From recent experiences, I am convinced that an equitable solution is possible. To that end, I present the following résumé of my own perception of the background in our Forces of the controversial aspects of the subject, together with my fundamental concepts of air defense elements and their functions.

U.S. Army antiaircraft artillery was born in World War I and established its home with the Coast Artillery Corps. Next to airborne, it is the youngest combat Branch in the Army. In the '20s, AAA suffered along with the rest of the Army from lack of appropriations and public apathy for anything military. Therefore, its early youth was characterized by faltering steps and undernourishment. Development of doctrine for this new Arm was anyone's oyster, due to lack of satisfactory reference material or precedent.

In the fall of 1938 a full scale air defense maneuver with Regular Army AAA regiments and Air Corps fighter elements was held at Fort Bragg. The Air Corps control idea, in which all AAA in air defense would be under Air Corps command and/or control, gained many supporters between that time and Pearl Harbor. A number of AAA officers told me the reason they favored joining our Branch with the Air Corps was because AAA might receive more appropriations and advantages under the Air Corps than under the CAC. During the 1930's, our air Arm enjoyed public support and a large slice of Congressional appropriations. At first, the Air Corps was indifferent to such a marriage but became more interested as the years passed. Precedents for such control had been established in England where the RAF took under its control the British Army AAA and in Germany, AAA was a part of the Luftwaffe.

Immediately prior to Pearl Harbor and during the war, several air defense commands were established in this country and overseas with varying degrees of affiliation between the Army AAA and the Air Corps. Because this country received no hostile air attacks within its continental boundaries and because allied air forces gained air superiority overseas, the doctrine underlying the need for such close affiliation was not put to a conclusive test in those air defense commands.

From 1942 to 1944, a number of Army field manuals were pushed through by supporters of Air Force control. These manuals stated in unequivocal terms that AAA *must* be under the Air Corps for effective air defense operations. They prescribed that air defense commands under the Air Corps will be composed of fighter units and AAA units. In Europe, the IX Air Defense Command in rear of the field armies originally followed such an organizational structure, but soon after operations on the Continent began, its fighter elements moved to the front, so that Command became, in reality an *AAA* Command (rather than an Air Defense Command) under the Air Force. As stated above, because of the dearth of conventional hostile air action in its area of operations, the efficacy of such doctrine was not put to a test, but many officers voiced objections to the logistical and administrative features of that arrangement. On the other hand, Army AAA units attached or assigned to field armies, corps and divisions overseas had considerable antiair action against hostile planes. Command and control of these units, with few exceptions, were vested in the large parent organizations, and joint AAA-Air Force operations in the battle zones were governed by coordination and cooperation between Army AAA units and the Tactical Air Commands at Army level. This arrangement proved to be so effective that both Air Force and Army units involved, praised the merits of such an affiliation.

Since the end of the war, the sentiment in the Army for joining AAA and the Air Force together has almost entirely disappeared. Perhaps this change is partly due to the fact that the most fervent officer proponents of such a policy are no longer in the Army, having transferred to the Air Force. But primarily, this change of sentiment is due to combat experience overseas. An overwhelming majority of some hundred senior Army AAA and other commanders interviewed in committees and boards overseas and in the United States since 1945 have voiced strong objections to the concepts of Air Force command and control of AAA.

Command or control of AAA by the Air Force violates the spirit of the "Functions Paper" which forbids merging of Services, but stresses coordination and cooperation, joint operations and unified commands. Support of unified commands, as brought out in General Collins' testimony, and in a smoothly operating joint Air-Ground team doctrine, possibly represents the present stand of the Department of the Army. The U.S. Air Force, it is believed, currently supports the Air Force control theory over AAA units.

Now, I would like to present my own ideas and weigh the good and bad points of the merging of AAA with Air Force under Air Force command and/or control.

First, let us suppose that all AAA was a part of the Air

Force as it was in the German Army, with several exceptions, during the last war. Incidentally, this arrangement failed miserably in Normandy and at Stalingrad according to German Army Commanders. Such a system would satisfy an Air Force belief that all operations against an enemy in the air are its responsibility, just as land operations are the responsibility of the Army, and sea operations are the function of the Navy. It would certainly represent an integrated team with optimum air defense capabilities, provided that AAA was not unduly restricted from firing. But this conjecture must be discarded completely for the following reasons: In the first place, the Air Force *does not want* AAA as an organic element, but does want primarily to control it (purely air problems keep the Air Force busy enough without taking on such tremendous added responsibilities as the development, procurement, and training of AAA); the Army has even more requirements for AAA than the Air Force, and, logistics, training, and administrative obstacles would preclude dividing antiaircraft artillery into an Air Force AAA and an Army AAA. (Such a double organization would be more costly than maintaining AAA as an Army element.)

If the Air Force does not want AAA, then what is wrong in giving it command and control over Army AAA? Since the mission of the Air Force is operations in the air, why shouldn't it control all arms which assist it in those operations? If you give a commander a job you should give him all the tools he might need. Well, by the same token, armored divisions opening up a hole in enemy lines for an infantry division should be placed under the infantry division, or corps and army artillery assisting a main assault division should be placed under the command of that division. Carrying the analogy further, why shouldn't bombardment aviation and particularly tactical support aviation, which assist the advance of the army, be under army command and control? But airmen, rather illogically in my opinion because of their demand for control over AAA, affirm that only the wearers of wings are capable of commanding or controlling aviation in combat operations. As I see it, there are two primary reasons why the Air Force should not command or control AAA: (1) AAA must be available on short notice to augment ground support missions; (2) after the establishment of air superiority by our Air Force it will be necessary to utilize excess AAA units to augment field artillery and surface to surface guided missile units. (Suppose an enemy air force made a surprise raid against the United States. Soon after the first bomb dropped, every city and hamlet in the country would clamor for AAA protection. It would certainly be impossible to provide, but AAA units would be increased tremendously. Then, as in the last war, when air superiority was established, it would be necessary to convert excess AAA units.) Such a change in assignment for units would be much more difficult to effect if they were under the Air Force than under Army command and control.

There are many more reasons against control of one Service over units of another. Some of these are: rotation for training of subordinate units may be resisted by the supported Service; operations of the attached units may be subordinated by the other Service, thereby preventing the full utilization of their capabilities; attached units may be required to carry more than their share of overhead; discipline and morale of attached units may deteriorate because the personnel will feel that they are "orphans"; lack of Army supervision of the attached units; much difficulty was experienced overseas with young, inexperienced Air Corps controllers who, being unfamiliar with the capabilities and limitations of AAA weapons, would sometimes order AAA to hold fire because one or two friendly planes were in the area and then, while AAA guns were thus silenced by the A.F. controller, an enemy raid would attack the objective.

In my opinion, there are two main reasons for the Air Force insistence to control AAA: protection of its planes from friendly AAA fire and to insure that its air fields will receive AAA support. These are sound reasons, to be sure, from the Air Force point of view. However, there are other things to be weighed. Considering the speed of modern aircraft, AAA control must be highly decentralized. The man on the gun, in the last analysis, governed by brief and clear rules of fire and having aircraft recognition ability or the assistance of electronic aids, must be the judge of whether to fire or not fire. Furthermore, the idea for control *presupposes* that Army AAA units will shoot down friendly planes as well as enemy planes *unless under Air Force control*. That, of course, is absurd because all the AAA units I saw in action would consider it a black mark on their record if they inadvertently shot down a friendly plane. But even under rigid control, it is no more possible to guarantee that no friendly planes will be shot down than it is to guarantee that artillery will not fire on our infantry or that friendly planes will never bomb or strafe friendly troops and positions. As for assured protection of all their airfields, there is not enough AAA to go around to protect everything. Priorities must be established by a theater or subordinate unified commander and only the most important objectives will receive AAA protection. It might be stated, however, that large airdromes are high on AAA priorities for protection. Air Force control would not change the need for establishing priorities.

Another point I would like to establish in this lengthy discussion is that fighter aircraft and antiaircraft artillery are entirely different types of weapons and do not actually operate as a team as do the artillery and the infantry. Fighters are highly mobile area defense weapons which normally range far forward to intercept enemy air attacks. Antiaircraft weapons, when compared with the mobility of aircraft, are relatively immobile, all-weather, day-and-night point defense weapons. In air defense, AAA and fighters do not mix up in one switching on-and-off action in the team sense. If they did, casualties in friendly planes shot down would be terrific. In fact, the only thing in common to the two is long-range warnings. Both AAA and fighters may operate entirely independently of each other, as they frequently did during the war. When electronic devices are developed to the point where reasonably accurate discrimination between friend and enemy is assured, there will be no reason whatsoever for more than the normal degree of necessary coordination existing in war between other combat elements of the two Services.

In considering these reasons against the Air Force control idea, in which *only they* are considered eligible to call signals, I wish to make it clear that this discussion is not

aimed against the normally accepted idea of teamwork. Under unification, all three Services must and should work hand in hand toward the common goal of defeating the enemy. No single Arm can win a war by itself. All possible coordination and cooperation between the Army, Navy and Air Force are necessary to win wars. These may be obtained, however, by adhering to the principles of joint operations, where each Service maintains its integrity of chain of command over its elements and all three Services assist each other to the maximum extent of their abilities. This represents a true team relationship; the other represents "forced labor" under strange bosses.

Guided Missiles

Finally, it must be realized that many of the above tenets apply to the past war and are already obsolescent, if not obsolete. For example, Dr. Vannevar Bush in his book, *Modern Arms and Free Men* predicted that mass bombing raids are already a thing of the past. Weapons development may well negate any logical reason whatsoever for Air Force Control over Army AAA.

I believe that the future of antiaircraft artillery will expand in direct proportion to the increased development of ground-launched guided missiles which are, to be sure, an extension of antiaircraft and field artillery weapons. For low altitude air attack, there will always be need for conventional weapons. But with the threat of enemy guided missiles and one enemy plane getting through to drop an atomic bomb, antiaircraft artillery, manning ground-to-air guided missiles and other weapons will become one of the most important Arms in our Army. It does not require a crystal ball to make such a prediction. I again refer to Dr. Bush's book, *Modern Arms and Free Men*. It gives a clear picture of the role guided missiles will play in our military establishment.

One Artillery Corps

All must agree that the foster mother of AAA, the Coast Artillery Corps, died heroically in the destruction and surrender of Corregidor. It was buried recently when the Department of the Army turned over controlled mines to the Navy. As a branch, AAA at this writing, stands alone.

As stated earlier in this article, there were some officers in AAA, several years ago who insisted that our Branch was too technical to combine with Field Artillery, and be able to maintain its technical proficiency. Some of those sentiments may still exist and undoubtedly, they are not hastily arrived at conclusions. However, I feel that such criticisms will disappear in a few years when the graduates of the Artillery Center make their ability felt in the service. The catalyst that will entirely amalgamate the two artilleries will be guided missiles. Both have common interest in the development of these new weapons of warfare. Furthermore, I do not subscribe to the contention that all officers have to be highly trained specialists to be successful AAA commanders. The accepted standards of command are universal, regardless of the Branch or Service and emphasize character, leadership and intelligence more than canalized technical knowledge. I am sanguine in believing that the proportion of potentially capable commanders, as well as those with technical ability, will be as high among graduates of the combined artillery schooling system as it would be if the two Branches pursued independent courses.

The Army Reorganization Bill, now in Congress, will probably become law by June of this year. One of its directives is to combine Antiaircraft Artillery and Field Artillery into one Corps of Artillery. Actually, this will result in little more than a paper transaction, because with the establishment of the Artillery Center after the war and the interchange of students and officers between the two Artilleries since then, one Artillery Corps has already existed in everything but name.

This combination was inevitable and will prove beneficial to both Arms. Unification of the Army, Navy and Air Force, assigning Military Academy graduates into the Army, rather than into separate branches, and war experiences sounded the death knell of Branch isolationism. Many benefits will accrue to AAA from this union. We will be combined with a Branch in our own Army family, many of whose missions are similar to ours; we will receive more strength in joint affairs; higher command eligibility will accrue from knowledge of the functions of more than one Branch; and appropriations are more easily justified and obtained by a large and important combat Arm than by a small one. It is not outside the realm of possibility, in view of the growing importance of guided missiles, that the future major tactical missions of this Corps of Artillery will be antiaircraft defense and guided missile offense.

Epilogue

In closing this article, I feel it would be remiss not to mention the magnificent support senior Army officers, active and retired, have accorded Antiaircraft Artillery since the end of the war. Also, mention should be made of those officers who contributed so much to AAA on unilateral and joint boards and committees and in high-level conferences. The fruition of all their efforts has shown most results since 1948. In order that antiaircraft artillerymen may know, as I do, what these officers have done in fighting for what is right, preventing dispersal of strength and proven unsatisfactory command encroachment, and mainly, in indoctrinating high Department of the Army officials with the great future potentialities of AAA, I would like to share the appreciation I feel for their efforts with the readers by stating their names. To do so, however, might omit the names of those who may have contributed much in this respect, but did not come to the author's attention. Therefore, I will desist from such an impulse. To those officers who have contributed to the future of our Corps, I gratefully dedicate this article. Never before has AAA enjoyed the legion of friends it now has in top Army circles. The results of these officers' efforts throw into discard the contentions that AAA is drifting and has no one to fight for "its place in the sun."

With united effort, loyalty and confidence we can be assured of an unprecedented future.

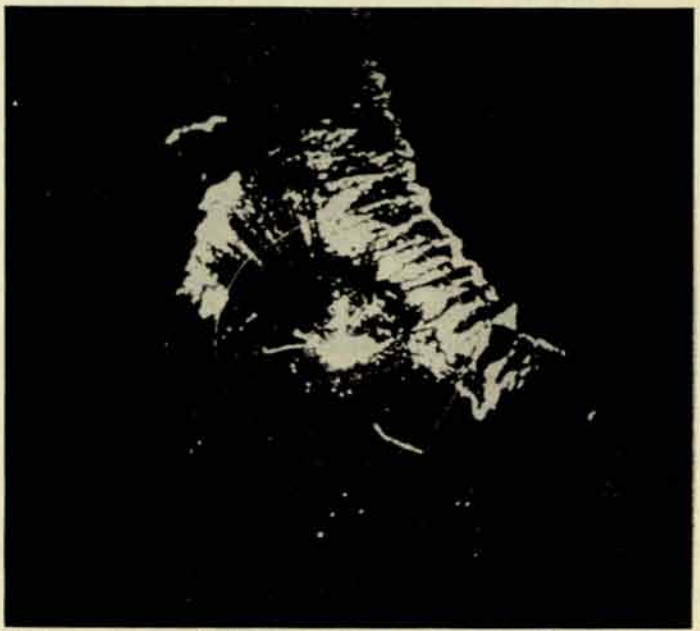
TEST YOURSELF ON RADAR

By Lieutenant Colonel Leonard M. Orman, CAC

Wherever you go or whatever you do in the CAC, you are going to run into radar in some form or another. While it is not considered essential that everyone know how to repair a set or even to operate one, every person in a position of authority must know something of this wonder device's possibilities and something of its drawbacks too. This test was designed to help you see how much you've picked up in the last few years on the subject. If you've never operated a set don't count the questions with asterisks. (Answers will be found on page 45.)

Fig. 1

1. The word RADAR means
   - a. Radio detection and ranging.
   - b. Radio, azimuth, direction and range.
   - c. Range, direction, altitude, radio.
   - d. Range, azimuth, detection, altitude, radio.
2. The set pictured in figure 1 is
   - a. SCR-268
   - b. SCR-584
   - c. SCR-784
   - d. AN/MPG-1
3. The type of scope pictured in figure 2 is
   - a. An A scope.
   - b. A B scope.
   - c. A PPI scope.
   - d. A K scope.
4. The J-scope on the SCR-584 is a version of the A-scope and gives
   - a. azimuth only.
   - b. range only.
   - c. altitude only.
   - d. Any two of the above.
5. The B-scope on the AN/MPG-1 gives range and azimuth in
   - a. polar coordinates.
   - b. rectangular coordinates.
   - c. a Mercator projection.
   - d. a Polyconic projection.



Koolau range on Oahu shows up clearly on . . . Range marker set at 15,000 yards intersects a formation of 23 LCIs.

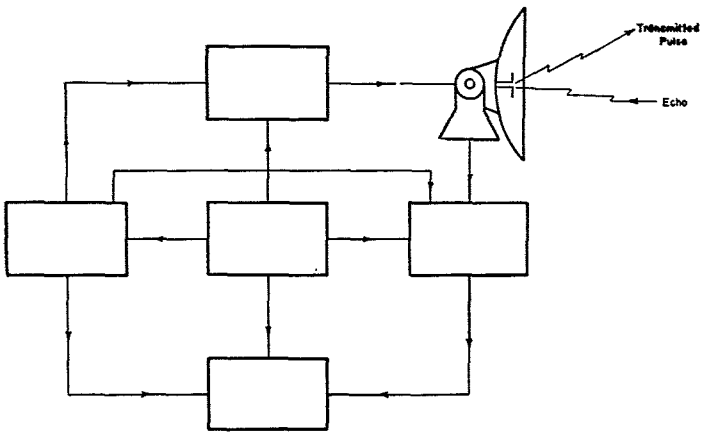
Fig. 2

6. The basic components of a radar set are
   - (1) power supply.
   - (2) indicator.
   - (3) transmitter.

(4) receiver.
(5) antenna.
(6) timer.

Put the proper title in each space in figure 3.

7. The most popular type of indicator used is the PPI. These letters mean
   a. Polyconic Projection Indicator.
   b. Plan Position Indicator.
   c. Have no meaning as such.
   d. Polar Projection Indicator.



RADAR BLOCK DIAGRAM
Fig. 3

8. We frequently hear the terms "S BAND," "X BAND," etc. used, the two mentioned being the most common. Match the proper band with the wavelength. Two sets now in use are given as aids.

S BAND (SCR-584)	a. 10 meters.
X BAND (AN/MPG-1)	b. 10 cm.
	c. 3 cm.
	d. 1 cm.

9. Radar, like all devices, has its enemies. One of the most used types in the war was the dropping of reflecting material to cause thousands of false echoes. This type of jamming is called
   a. Mechanical jamming.
   b. Electronic jamming.
   c. Interference.
   d. Radar-busting.
10. The second type of jamming is the creation of static-like noises and thus clutter-up scopes. This type of RCM is called
   a. Mechanical jamming.
   b. Electronic jamming.
   c. Radar-busting.
   d. Window.
11. The tin-foil cut to a critical length (half the wavelength of the radar to be jammed) had many nicknames but the most popular one was
   a. Radar-foil.
   b. Bogies.
   c. Window.
   d. Phantoms.
12. An auxiliary device used with radar for identification purposes was IFF. These initials mean
   a. Identify or Face Flack.
   b. I'm Flying For (You).
   c. I'm Friendly Flight.
   d. Identification of Friend or Foe.
13. IFF didn't work too well. The chief reason for its failure was
   a. Electronic defects.
   b. Failure of ground crew to cooperate.
   c. Failure of airborne equipment.
   d. Failure of pilots to turn equipment on.
14. A PPI scope presents
   a. Range, azimuth, and altitude.
   b. Azimuth only.
   c. A polar map.
   d. Range only.
15. The very narrow beam width of the antenna makes the job of searching for targets
   a. Easier.
   b. More difficult.
   c. Much easier because it utilizes micro waves.
   d. None of the above.
16. The set in figure 4 is
   a. SCR-784.
   b. AN/TPQ-3.
   c. AN/TPL-1.
   d. SCR-268.
17. One function of an antenna is to
   a. Radiate r-f energy supplied by transmitter.
   b. Determine carrier frequency.
   c. Establish maximum range.
   d. Provide timing control of units.
18. Radar accomplishes its mission of locating objects by transmission of
   a. Radio energy and the reception of refracted energy.
   b. Radio energy and the reception of reflected energy.
   c. Radio energy and the reception of sound echoes.
   d. Sound energy and the reception of sound echoes.
19. R-f energy travels through the air at a velocity which is
   a. Dependent on ionospheric conditions.
   b. A logarithmic function.
   c. Fast at the start but slower as it travels farther away.
   d. Constant for all practical purposes.
*20. How long is required for r-f energy to travel a loop mile (a mile out and back)?
   a. .0000107 second.
   b. .0000162 second.
   c. 18.6 microseconds.
   d. 32.8 microseconds.
21. Radar antennas have a very narrow beam to enable them to better determine
   a. Range.
   b. Azimuth.
   c. Identification.
   d. Size.
22. The tendency to go higher and higher in radar frequencies is because
   a. Antenna systems can be made more directional and yet have a small physical size.
   b. Higher frequencies are easier to produce than lower frequencies.

Fig. 4

c. Smaller tubes can be used to generate r-f energy.
d. Better line of sight characteristics are obtained.

23. When a single antenna is used to transmit and receive, it requires the use of a
    a. T-R Box.
    b. Special timing system.
    c. More directional antenna system.
    d. Echo box.
24. The indicator is a unit to
    a. Indicate the performance level of the set.
    b. Present a visual display of target echoes.
    c. Give an aural indication of enemy plots.
    d. Indicate the amount of power being used.
25. The most commonly used type of indicator instrument is
    a. A direct reading meter.
    b. An indicator dial.
    c. A cathode-ray tube.
    d. A magic eye.
*26. An echo that returns in 200 microseconds indicates a target range of
    a. 16,400 yards.
    b. 32,800 yards.
    c. 40,000 yards.
    d. 65,600 yards.
*27. How many microseconds will elapse before an echo returns from a target 2,000 yards away?
    a. 6.1.
    b. 10.2.
    c. 12.2.
    d. 21.4.
28. A microsecond is
    a. 0.1 second.
    b. 0.01 second.
    c. 0.001 second.
    d. 0.000001 second.
29. In radar, range is determined by
    a. Measuring the time for the r-f energy to go to the target.
    b. Measuring the time for the r-f energy to go to the target and return.
    c. Measuring the time interval between reflections from two targets.
    d. Measuring the time interval required for one complete revolution of the antenna from the target back around to the target again.
30. Azimuth is determined by
    a. Concentrating the energy in a very narrow beam and noting direction of antenna.
    b. Measuring the time interval for the r-f energy to sweep across the target.
    c. Measuring the angle the pip covers on the scope.
    d. Measuring the time interval required for one complete revolution of the antenna from the target back around to the target again.
31. The six basic components of a radar set are
    a. Transmitter, T-R Box, echo box, receiver, timer, and indicator.
    b. Transmitter, power supply, receiver, timer, antenna, and indicator.
    c. Transmitter, timer, antenna, T-R Box, indicator, and power supply.
    d. Receiver, timer, transmitter, antenna, power supply, and T-R Box.
32. The "clock" used for the measurement of the small time intervals employed is
    a. The transmitter.
    b. The receiver.

c. The modulation generator.
d. The antenna system.

33. Radar uses frequencies
a. In the audio region.
b. About the same as commercial broadcasting.
c. About the same as X-ray equipment.
d. None of the above.

*34. A radar set that transmits a pulse of 5 microseconds will start its useful range at (approx.)
a. 200 yds.
b. 575 yds.
c. 820 yds.
d. 1,070 yds.

35. Increased ranges are sometimes caused by
a. Diffraction due to curvature of the earth.
b. Refraction due to atmospheric conditions.
c. Refraction due to mountains.
d. Refraction due to ionosphere.

36. The minimum range at which a target may be detected is dependent largely upon
a. Antenna pattern.
b. Pulse width.
c. Pulse repetition rate.
d. Atmospheric conditions.

37. It is generally assumed that refraction has the effect of increasing the distance to the apparent horizon for radar by
a. 5%.
b. 10%.
c. 15%.
d. 25%.

38. Nearby targets may not be detectable on a radar set because
a. Their echoes are masked by the main pulse.
b. Their echoes coincide with each other.
c. Of absorption of energy in surrounding terrain.
d. They return too weak a pip at close ranges.

39. Trapping, guided propagation, or anomalous propagation may be defined as
a. The art of interpreting scope pictures.
b. The appearance of weather phenomena such as clouds, rain and snow on scopes.
c. A pronounced bending of the radar beam toward the surface of the earth.
d. Reflection of radar waves from the ionosphere.

40. The net effect of trapping is
a. To decrease range.
b. To increase range.
c. To make range measurements less accurate.
d. To make bearing measurements less accurate.

41. Fog may act to
a. Black-out the set.
b. Increase the range.
c. Decrease the maximum range.
d. Make measurements of range and bearing less accurate.

42. Icing conditions may
a. Increase maximum range.
b. Decrease maximum range.
c. Increase minimum range.
d. Decrease minimum range.

43. Radar range accuracy
a. Varies with atmospheric conditions.
b. Varies with range (% of range).
c. May vary if supply voltage fluctuates.
d. Is a function of beam width.

44. Range resolution may be defined as
a. The ability of a set to separate two echoes which are at the same range and closely spaced in azimuth.
b. The ability of a set to separate two echoes which are at the same azimuth and closely spaced in range.
c. The ability of a set to make precise range measurements.
d. The characteristic of a set which gives it a short minimum range.

*45. Which of the following does not affect range resolution?
a. Pulse length.
b. Size of scope in use.
c. Setting of receiver gain.
d. Beam width.

46. Azimuth resolution may be defined as
a. The ability of a set to separate two echoes which are at the same range and closely spaced in azimuth.
b. The ability of a set to separate two echoes which are at the same azimuth and closely spaced in range.
c. The ability of a set to make precise azimuth measurements.
d. The characteristic of a set which gives it a large minor lobe echo.

47. Which of the following sets will have the better range resolution?
a. One with a ¼ microsecond pulse.
b. One with a ½ microsecond pulse.
c. One with a one microsecond pulse.
d. One with a two microsecond pulse.

48. Which of the following sets will have the better azimuth resolution?
a. One with a ½ degree beam.
b. One with a 1 degree beam.
c. One with a 2 degree beam.
d. One with a 1½ degree beam.

49. The term "marker pips" as applied to PPI scopes refers to
a. Echoes from stationary targets.
b. Responses from marker beacons within effective range.
c. Range calibration markers along the sweep length.
d. Echoes from corner reflectors.

50. The pulse repetition frequency is limited because
a. Too frequent pulses would injure the oscilloscope screen.
b. The maximum range would be reduced.
c. The minimum range would be increased.
d. The antenna cannot rotate any faster.

51. Which of the following is true?
a. Optical azimuths are more accurate than radar azimuths.

b. Optical azimuths are less accurate than radar azimuths.
c. No comparison can be made between radar and optical azimuths.
d. Optical and radar azimuths have about the same degree of accuracy.

52. "Snow" on PPI scopes is caused by
a. Snow.
b. Rain.
c. Interference.
d. Internal causes within the set.

53. The purpose of the viewing hood is
a. To magnify the picture.
b. Protect the operator's eyeglasses.
c. To shield the fluorescent screen from stray light.
d. To enable viewing of the chart and the screen at the same time.

54. Pipology is the term given to
a. The measurement of range of pips.
b. The measurement of bearing of pips.
c. The art of interpretation of all types of contacts.
d. The obtaining of radar fixes under difficult conditions.

55. Which of the following pip characteristics does NOT aid in pip interpretation?
a. Size of pip.
b. Shape of pip.
c. Movement in range and azimuth.
d. Color of pip.

56. Size of the pip is NOT affected by which of the following?
a. Size of target.
b. Range of the target.
c. Speed of antenna rotation.
d. Material of which the target is composed.

*57. All of the following characteristics except one aid in identifying land contacts. Which is the one?
a. Not moving.
b. Should be at expected positions.
c. Usually fade more than other targets.
d. Usually cover greater area on screen than other contacts.

*58. Which of the following types of land will give the best echo?
a. A low sandspit.
b. Mud flats and marshes.
c. A sharply rising cliff.
d. Coral atolls.

*59. Which of the following types of target will give the worst echo?
a. A mountain.
b. A wooded island.
c. A submerged rock.
d. A lagoon surrounded by low islands.

60. Which of the following will NOT return an echo?
a. Fog.
b. Rain.
c. Cloud.
d. Snow.

61. A minor lobe echo is an unwanted echo caused by
a. The bouncing of the echo off of nearby objects.
b. Reflection from objects of minor interest.
c. Echoes from energy which has leaked off in side and back lobes.
d. The return of an echo from pulse 1 after pulse 2 has gone out.

62. Reflection echoes are caused by
a. The bouncing of the echo off of nearby objects.
b. The return of an echo from pulse 1 after pulse 2 has gone out.
c. Pulse duration distortion.
d. Beam width distortion.

63. Second-trip echoes, another example of false echoes, are caused by
a. the bouncing of the echo off of nearby objects.
b. The return of an echo from pulse 1 after pulse 2 has gone out.
c. Pulse duration distortion.
d. Beam width distortion.

64. A target which is behind another reflecting object such as a mountain will not give an echo because
a. It is in a radar shadow.
b. Of intimidation.
c. Pulse duration distortion.
d. Minor lobe echoes.

65. Blind sectors may exist on some azimuths
a. Because of improper siting.
b. Because of fog.
c. Pulse duration distortion.
d. Too rapid antenna rotation.

*66. Beam width distortion causes targets to appear
a. Wider.
b. Smaller.
c. Longer in range.
d. At a false bearing.

*67. Pulse duration distortion causes targets to appear
a. Wider.
b. Smaller.
c. Longer in range.
d. At a false range.

68. Which of the following is least likely to cause interference with radar operation?
a. Other radars.
b. Communications equipment.
c. Aurora Borealis.
d. Loran.

69. Only experienced men should attempt to repair radar sets for, in addition to being a complex instrument,
a. r-f energy can cause baldness and sterility.
b. High voltages are used in radar and may cause death.
c. Radar is a patented device and still highly secret.
d. No circuit diagrams are available.

70. Preventive maintenance can greatly cut down the number of equipment failures
a. Since lots of oil will keep tubes cool.
b. The life of tubes can be predicted and replacement made before they give out.
c. Opening the cabinet often airs the interior of the set.
d. The life of resistors is short in radar equipment because of the excessive heat generated.

71. Echo boxes find their chief use in
    a. Eliminating saturating echoes from nearby targets.
    b. Tuning the receiver to the transmitter.
    c. Tuning the transmitter to varying atmospheric conditions.
    d. Retuning the set when range scales are changed.
72. Which of the following is NOT a use of the echo box?
    a. To indicate approximate transmitter output.
    b. To measure frequency.
    c. To provide a "phantom target."
    d. To trap undesired echoes.
73. Secondary radar means
    a. War surplus equipment.
    b. Radar on 10 cm. band.
    c. Aids to radar, i.e., beacons.
    d. Echo boxes.
74. A corner reflector is an object composed of two plane reflecting surfaces which are at right angles. When placed on a target
    a. They return a coded reply.
    b. Make the target pip resemble a T.
    c. Make the target visible from greater distances.
    d. Keep the target pip off the screen of the radar.
75. The gadget pictured in figure below is a radar training device. Its name is
    1. Radar Prediction Device (RPD).
    2. Radar Photograph Simulator (RPS).
    3. Radar Simulator Very Positive (RSVP).
    4. Radar Photo Faker (RPF).

This photograph shows the . . . in action. The areas illuminated are those which would appear as ground clutter.

First, in peace, we must constitute an instrument strong enough to lend strength and force to the words of our diplomats, who are ceaselessly striving to maintain the peace. Sad experience has shown us that the influence and prestige of any foreign minister are directly proportional to the number of divisions, war vessels, and aircraft he has arrayed in his corner. We might call this primary mission in peace "the furtherance of the national policy of avoiding war."

Second, if war comes, despite our utmost efforts to avert it, our armed forces in being must possess the ability to retaliate instantly, decisively, and with overwhelming power to any underhanded, sneak attack such as the one on December 7, 1941. Sad experience here again has shown us that war, which used to be the ultimate expression of one nation's policy in disagreement with that of another, and as such maintained a certain dignity and respect for humanity, has now degenerated into a form of national gangsterism. Just as the counter against organized crime has proved to be the unremitting, relentless pursuit made possible by the F.B.I., so must the counter to deliberate national crime be the certainty of being brought to justice.
—*General Omar N. Bradley.*

Reconnaissance, Selection and Occupation of Position for Field Artillery

By Lieutenant Colonel Edward S. Berry, F.A.

There is no fixed doctrine for the tactical movement of field artillery units on the battlefield. We have, to be sure, a number of principles that are generally applicable under varying conditions of attack and defense, terrain, mobility of equipment, and knowledge of the situation. Like all combat principles they are derived from the principles of war.

General Principles

Standard procedures for movement should be a part of every unit's standing operating procedure. It need not all be written but it should cover loading of vehicles, indexing of the terrain, signal usage and prearranged message codes (SOI and SSI), and a standard loading of battalion and battery commander's parties to consist principally of reconnaissance, survey, and communication elements. It should include provision for route marking.

The mobility of artillery assigned a supporting mission should at least equal the mobility of the units of other arms it supports. For example, we find that only self propelled artillery is organic to our armored divisions. Self propelled and armored artillery is preferred for attachment to a general outpost, mainly because of its superior battlefield mobility.

The artillery commander should anticipate and prepare for his own movement by frequent command liaison visits and by having a thorough knowledge of the supported unit's plan. To do this he must keep informed of the latest reports from his liaison officers and air and ground observers. By studying his inteligence reports and target data, the commander can often decide in advance about where and when his movement will be required and thus be prepared to move at the proper time.

The artillery commander should plan to move his unit forward when the front lines have advanced a distance of one half the maximum range of the guns in front of the old position. Early planning is done to allow for any contingency. Actually, the order for the movement will usually be given when considerations other than range require it. These considerations include the need for proper timing to give maximum fire support, availability of routes and road space, and the need for concealing the movement from enemy observation. Rearward movements are subject to the same considerations except that initial ranges are usually longer. This is particularly true in the case of the direct support battalions in support of a main battle position.

Road priorities should be obtained for artillery displacements when required. This is usually covered in the standing operating procedure of the division or corps. During exploitation with armored units, it is customary to allow the light artillery to double the column at halts whenever necessary. Tank and infantry units that are trained to move forward off the roads into any available dispersal area, immediately after leading elements are halted by the enemy, often make such doubling unnecessary. In Europe this maneuver was called "coiling forward."

Positions chosen must enable firing batteries to accomplish their missions. In the offense, field artillery is placed well forward to support the attack with fewer displacements. In the defense, firing units are echeloned in depth to allow continuous support in spite of local enemy penetrations. Artillery units occupy little space and can be fitted around and among other units, such as trains and elements in reserve. Priorities on position areas are seldom necessary. Rocky or swampy ground should be avoided whenever possible. Concealment from air and ground observation is an important consideration for all installations. Defilade in front of firing batteries should be sufficient to cover flash. Temporary positions often fall short of many of these tactical requirements, but they must allow accomplishment of the mission.

Reconnaissance for new positions should anticipate the many possible contingencies in keeping with the situation. Commanders should limit their parties to individuals and vehicles required. Some members of the party may be directed to join the commander in the position area. The shorter the time available, the more the search for positions should be decentralized. Fragmentary orders may often be issued. The speed of the advance may change at any time. Therefore, the desired ranges from position areas to objectives must be kept in mind. As soon as a battery commander has been given his area he may be released; when the battery positions have been chosen the survey officer can be given his orders and released; and when the main elements have been located, the communication officer will be ready to recommend his plan, have it approved, and direct his assistants to begin its execution.

Commanders should be aggressive when conducting re-

connaissance in the offense but somewhat more security minded when on the defense.

The Decision

General principles do not apply equally in all situations. They are simply guides for the commander and he should understand that he cannot always apply them in their entirety. Local conditions determine which principles are the most important in any given situation. The commander's decision is the result of his applying to the local situation, as he knows it, those principles that he considers to be the most applicable. Thus, local considerations and factors are of great importance in arriving at a decision. Examples of such considerations are weather, terrain, the enemy situation, enemy capabilities and the state of training of our own troops.

Three Types of RSOP

War experience and postwar training with new units both indicate that occupation of position by field artillery should be considered under three general headings. They are *deliberate RSOP* from rear area or rendezvous, *rapid RSOP* from march column, and *displacement.*

Deliberate

The deliberate RSOP permits time for detailed planning and reconnaissance. Personal reconnaissance by the commander and execution of survey and communication work, before and during occupation is usually possible. The commander may use a fairly large party and deliver all his orders personally to subordinates. Examples of this type of RSOP occur in relief in combat, in reinforcement of units already in action and in assumption of a defense in the rear. It is used most frequently in the build-up for an attack.

Rapid

RSOP from march column is of the rapid or immediate type. There is usually insufficient time for detailed reconnaissance; positions may be occupied temporarily and moved or adjusted later for improvement. Reconnaissance and even decisions to adopt a plan of survey or communication are delegated to subordinates as necessary and confirmed or altered later. It is here that liaison with the supported units furnishes useful information on which decisions on artillery dispositions can be based. Much time is saved by use of fragmentary orders delivered by radio, by messenger, or in person. A well developed unit standing operating procedure and identification of terrain features in a common indexing system make it possible to issue radio orders to move, meet at a locality, or commence firing from a new position immediately, without breach of security.

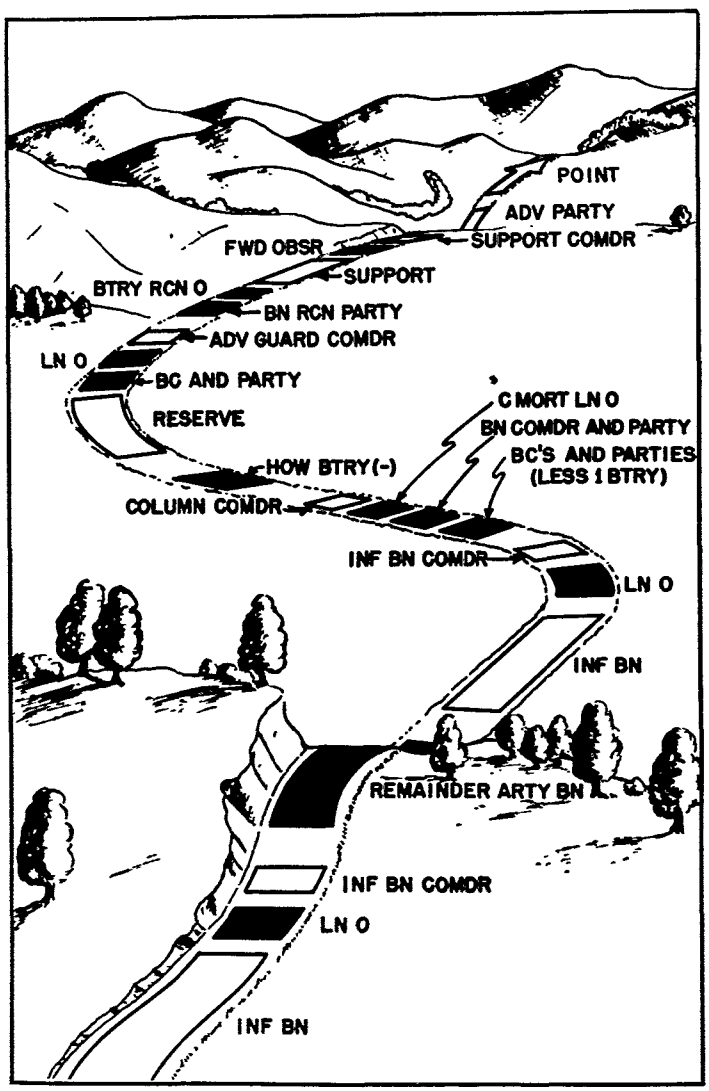


Figure 1. Field Artillery in a Typical Combat Team Column.

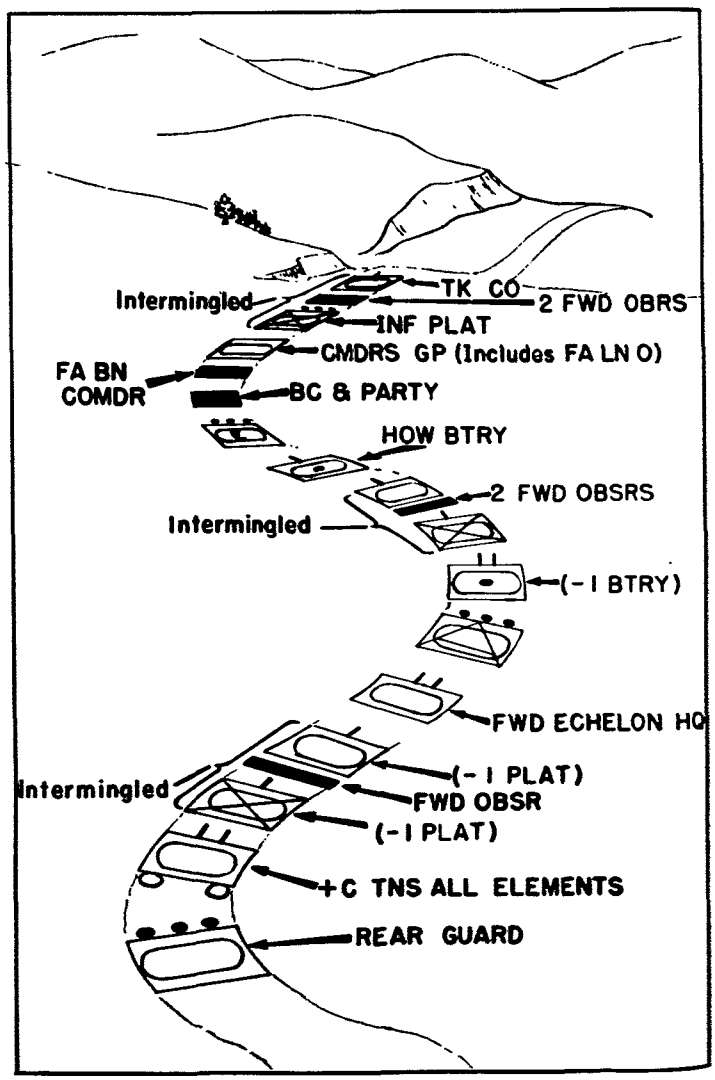


Figure 2. Field Artillery in a Typical Armored Column.

For a type disposition of towed field artillery in a motorized column of regimental combat team size, see Figure 1. For a somewhat similar disposition of armored field artillery in an armored division column see Figure 2.

Displacement

Displacement has some features of each of the other types of RSOP. It is characterized principally by the fact that the unit being moved is already engaged. The unit is responsible continuously for giving whatever fire support is required of it, unless it is relieved by other units able to deliver the fire requested. Movement must conform to the plan of the supported or reinforced unit. The commander usually conducts the necessary reconnaissance in company with the subordinate commanders involved and delivers his orders personally in fragmentary form. The movement may be deliberate or it may be hasty, with little prior planning, as in the case of a fast moving attack.

Procedures

If time permits assembling the party, it should accompany the artillery battalion commander forward. If time does not permit this assembly, the party should be sent forward as soon after the commander's departure as possible.

Only the battalion commander and one assistant should be present to receive the division artillery or supported unit commander's order. Other vehicles and personnel of the party should remain concealed at a point some distance away.

Only the battery commanders and selected staff officers should be present to receive a complete verbal order from the battalion commander. Other personnel and vehicles should be concealed nearby. Fragmentary orders may be issued at any time. Missing details can be transmitted later by means of staff visits or messages.

Either the battalion commander or a designated subordinate must select battery positions, base point and check points, battalion observation posts, a command post area from which the batteries can be controlled and a landing strip. The radar officer ordinarily should be released to select a suitable radar position as soon as the front lines, the zone of action of the supported unit and the general position area of the battalion are known. (Only the divisional light battalions are equipped with countermortar radar.)

Howitzer battery commanders, assisted by members of their parties, select locations for battery installations. The headquarters battery commander's party augments the battalion commander's party.

When a single howitzer battery is marching with an advance guard, the battery is given the mission of supporting the advance guard; it should not be attached to the advance guard. The battery commander should be authorized to occupy position on his own initiative. He occupies position when contact with the enemy is made, or is imminent. As the attack advances, another battery should be moved forward or the remainder of the battalion committed in leapfrog fashion, since the first battery will shortly be out of range.

Composition of Parties

Composition of parties and loading of vehicles taken on reconnaissance vary with the enemy situation, availability of maps, state of training, weather, availability of cover and concealment, orders of higher and supported headquarters. The commander must have a basic loading plan in his own unit SOP. He can either use or alter it as he believes the situation requires. Many commanders will want the S-3 in the battalion commander's vehicle. Others will want him in his own vehicle, to accompany the first battery in displacement and to take over fire direction in the new area at the earliest possible time.

Division artillery, corps artillery and group commanders perform only such position area reconnaissance as they deem necessary. They seldom perform a formal RSOP in the company of battalion commanders and their parties. Normally, orders are delivered to battalion commanders at an appointed time and place. Orders are issued as soon as the necessary decisions have been made.

Direct support and primary reinforcing mission battalion commanders are expected to put their units in action in accordance with their missions without receiving a detailed order from the division artillery commander. They are required to keep him informed of their dispositions under these conditions. According to postwar doctrine for all types of artillery, the direct support battalion commander orders movement of both his own and a primary reinforcing battalion.

The artillery battalion commander's party should contain a command element, a reconnaissance and survey element, and a communication element. Besides these basic elements, the commander may wish to include his S-2, his radar officer and a light aviation representative. These officers may ride in separate vehicles with their assistants, or they may be loaded in with the essential elements listed above. Large parties are not advocated either by this writer or by The Artillery School. They should be kept to the minimum that can do the job efficiently and in time.

The howitzer battery commander's party should contain a command element and the battery detail key men needed to occupy position. The communication and survey elements of the detail may be loaded either in their own vehicles or in the detail truck.

The headquarters battery commander's party should contain a command element, those wire and survey elements that will be needed in the forward area and are not already included in the battalion commander's party and the train agent from the service battery. The train agent rides in his own vehicle.

The following is an extract from the direct support battalion standing operating procedure on organization of reconnaissance parties based on T/O&E 6-25N used for exercises by the Department of Combined Arms at The Artillery School at Fort Sill:

* * * *

A TYPE STANDING OPERATING PROCEDURE

Section IV

Reconnaissance Parties

1. GENERAL.

   a. If size of reconnaissance party is not specified, party may consist of all vehicles listed in paragraph 2.

b. If number of vehicles is limited, vehicles will be eliminated in order inverse to that listed in paragraph 2a, 2b, and 2c.
c. Commanders may increase, decrease, or transfer personnel listed in paragraphs 2a, 2b, and 2c.

2. COMPOSITION.

a. Battalion Commander's Party: (*indicates personnel added to normal load)
(1) Bn Comdr's Trk:
(a) Bn CO.
(b) Sgt Maj*
(c) R-T Opr (Dvr).
(2) Rcn and Surv O Trk:
(a) Rcn and Surv O.
(b) Surv and Inst Cpl.
(c) R-T Opr (Dvr).
(3) Com O Trk:
(a) Com O.
(b) Wire Sgt.
(c) R-T Opr (Dvr).
(4) S-2 Trk:
(a) S-2.
(b) R-T Opr (Dvr).
(5) Radar O Trk:
(a) Radar O.
(b) Ch Obsr.
(c) R-T Opr (Dvr).
(6) Air Sec Trk No. 1:
(a) Pilot.
(b) AP Mech (Dvr).

b. Howitzer Battery Commander's Party: (*indicates personnel added to normal load)
(1) BC Trk:
(a) BC
(b) R-T Opr (Dvr).
(2) Detail Trk:
(a) Asst Ex O (Mun O)*
(b) Ch of Fir Btry (1)*
(c) Com Sgt*
(d) Ch of Det.
(e) Scout Cpls, No. 1 and No. 2.
(f) MG Sgt.
(g) R-T Opr.
(h) Driver.
(3) Rcn and Surv O Trk:
(a) Rcn and Surv O.
(b) Inst Cpl.
(c) R-T Opr (Dvr).
(4) Wire Trk No. 2:
(a) Sgt Lineman.
(b) SB Opr.
(c) Lineman (2).
(d) Lineman (Dvr).

c. Headquarters Battery Commander's Party: (*indicates personnel added to normal load)
(1) BC Trk:
(a) BC.
(b) Mg Sgt*
(c) R-T Opr (Dvr).
(2) Inst and Surv Trk:
(a) Sgt, Ch of Survey (1).
(b) Inst and Surv Sgts (2).
(c) Inst and Surv Cpl (1).
(d) Rod and Tapeman (1).
(e) Rod and Tapeman (Dvr).
(3) Train Agt Trk (Sv Btry):
(a) Agent.
(4) Wire Trk No. 2:
(a) Wire Sgt.
(b) SB Opr.
(c) Lineman (4).
(d) Driver.

It should be noted that the document quoted is entitled "A Type Standing Operating Procedure." The procedure both in cutting out vehicles and in varying the loads of vehicle retained, should be very flexible.

Antiaircraft Protection

No discussion of field artillery RSOP is complete without a consideration of the AAA automatic weapons units—units that furnish protection from enemy air attack and participate on occasion, in ground action both defensive and offensive. Field artillery is especially vulnerable to low flying enemy air attack; its organic caliber .50 machine guns cannot provide adequate protection. Therefore, we teach that most higher commanders will assign first priority to the antiaircraft protection of their field artillery, whenever the continuance of the field artillery in action without enemy air hindrance is vital to the mission of the force.

If a battery or a platoon of AW is assigned the mission of protecting a battalion of field artillery, it must protect the field artillery in position, on the march, and in the new position. The antiaircraft units are not shown in Figure 1 but they will ordinarily be present and distributed in the column in accordance with the standing operating procedure being followed. The AW battery commander should keep in close touch with the protected field artillery commander and accompany him on reconnaissance whenever possible. The AW battery commander's party should fit the needs of the situation. When the protected unit commander decentralizes his reconnaissance in rapidly moving situations, the AW commander must do likewise, allowing platoon and fire unit commanders great latitude. Under these conditions, he can readjust his units after they arrive on the ground. He must give particular attention to battery and platoon boundaries, where readjustment between units may be required.

Summary

The most important objective in field artillery RSOP is to be ready to furnish effective fires at the proper time. The positions chosen, must follow accomplishment of the mission and should have other desirable characteristics. Displacements should be planned so that fire support if needed, is available continuously. To accomplish these results best, the commander must learn the needs of the supported unit. Armed with a detailed knowledge of the situation, a commander is well equipped to issue timely and effective orders.

THE ROTC FROM A TO Z

By Colonel E. W. Timberlake, CAC

Unaccustomed as I am to public thinking, habitual reading of the *Coast Artillery* and *Infantry Journals* since World War I days in the 26th Infantry of the Fighting First has provided many a provocative thought, particularly the recent article by William G. McMackin in "Better ROTC Training" and rebuttals thereto by Lester D. Johnson, John E. Denn and Arthur L. Baker in the *Infantry Journal.*

As in so many instances of acrimonious discussions of controversial subjects, there is a divine mean, and to my mind M/Sgt. John E. Denn comes close to hitting that mean when he says that "ROTC duty is not a gravy-train" and "to make ROTC a success you must have faith in it and believe in it." The thought occurs that perhaps too many of us feel that "ROTC is a three-year rest and rehabilitation assignment," to quote the McMackin article, and pursue our mission accordingly.

Having served with Utah's mountain men from the Normandy Beaches, in the race through France, Belgium and Germany, to the Elbe, I chose and was appointed as Professor of Military Science and Tactics at Utah State Agricultural College. After a thorough indoctrination course in the ROTC Instructional School at Fort Belvoir, Virginia, and my Branch school, I arrived at the scene of my future scholastic triumphs all bright-eyed, to welcome an initial ROTC enrollment of four Advanced Cadets (thoroughly disillusioned GI's) and twenty Basic Cadets.

The college authorities were not at all sold on ROTC at the moment; felt that we had just finished a second World War to end all wars, and in consequence, the ROTC classrooms were occupied by others, as was the schedule of classes. We were informed that we could teach the tricks of our trade after 5:00 P.M. or on Saturday. In addition, two-thirds of the five thousand registered college students were war-weary GI's with a fixed aversion to all things military, who looked upon a be-ribboned colonel as something less than their answer to the GI Bill of Rights.

What we did to overcome this aversion and expand this setup from one unit, two instructors and twenty-four cadets, to three units, forty instructors and two thousand one hundred fifty-eight cadets (nine hundred forty-eight Advanced) in a period of three years may be of some interest to those for whom the Career Management people intend at least one tour of civilian component duty in their brief but glorious military careers.

Before launching into the following bill of particulars, I want to strongly emphasize the necessity of the Military Department of any educational institution *becoming an integral and useful part of the college and community,* because I feel certain that the difference between mediocrity and superiority depends upon whether the members of the Military Department remain aloof, as so many do, or get in there and make themselves known and liked individually and collectively.

The PMS&T, and to a lesser degree all hands, should begin this project at the top and get to know the president and the deans, professors, instructors, etc., at their respective levels, socially and officially, in the most intimate manner that the circumstances permit. This, at first glance, is a formidable project, but with a little milk of human kindness, tact and diplomacy, it is surprising to realize that the academic people are really human and understanding with a great many interests similar to our own, if and when we go out of our way to cultivate them.

Once the PMS&T and staff begin to produce for the college and have been able to integrate and ingratiate themselves with their opposite academic numbers either through services rendered or through golf, tennis, bridge, hunting, fishing or other exercises, it is relatively easy to write one's own ticket for ROTC on any campus. It will be found that the deans, department heads and instructors will actively and enthusiastically promote the ROTC program. Thus the way becomes clear to proportionate credits, classrooms and class hours, secretarial assistance and other facilities.

Once oriented, the academic people will acclaim ROTC as a definite asset to their educational institution in drawing students, bringing money on the campus, deferment from the draft, and in providing placement for the great overflow of veterans. These lads, whether they realize it initially or not, are naturals for a military career.

When the academic people and the college authorities are sold, the veterans can be won over by individual personal consideration, academic support and the fluent presentation of the cogent advantages of ROTC training and consequent integration into the regular establishment. The community leaders will string along for there is opportunity for their sons as well as gold "in them thar ROTC hills" for themselves.

In any organization with as large a yearly attrition rate as the Army and as many diversified fields, personnel procurement becomes not only an important problem, but a continuous one. To meet the Army officer procurement objective it is necessary that a steady supply of young men be integrated into the Army as junior officers. The numbers graduating yearly from the United States Military Academy fall far short of supplying the necessary requirements; therefore, it is essential that the remainder be obtained through other sources, particularly the senior ROTC divisions.

We have been told that the results of a survey of five famous divisions in the ETO at the close of World War II hostilities, indicated that approximately two-thirds of their

combat unit leaders from platoon to battalion were ROTC trained. It is desired that the postwar ROTC program produce some twenty-two hundred Reserve officers annually with some ten per cent of these being integrated into the regular establishment. Hence, it is obvious that the ROTC cadet of today will likely provide the officers for our Armed Forces of tomorrow, and it behooves all officers on ROTC assignment to do their duty with honor for their country.

All the following suggestions and recommendations are practical rather than theoretical, and all those pertaining to campus and community have proven their practical worth through successful application during the past four years. I commend them and their equivalent to all PMS&T's and future ROTC Instructors.

RECOMMENDATIONS AND SUGGESTIONS FOR FACILITATING ROTC PROGRAM AND ROTC-REGULAR ARMY-REGULAR AIR FORCE INTEGRATION

HIGHER AUTHORITY

Increase the priority and improve the importance of ROTC Program.

A. Procurement of highly qualified PMS&T's and an adequate number of instructors who have been thoroughly indoctrinated with the technique of teaching as well as public relations in a special civilian component training course at their Branch schools. ROTC should not be considered as the "end of the line" or "just another assignment" by either the PMS&T, the assistant PMS&T's, or the maintaining authorities.

B. Selection of staff officers in civilian component sections of higher headquarters, with ROTC PMS&T or equivalent experience. Thorough indoctrination of all inspecting officers with ROTC policies and procedures prior to being sent out on inspections.

C. Facilitate procurement of supplies, transportation, modern matériel and training aids. This to include prompt decision on requests and requisitions, as well as dissemination of commutation checks.

D. Summer Camp is the best selling opportunity for the ROTC program as well as for ROTC-Regular Army integration. Treatment of cadets at summer camps should be that of junior officers, not recruits. The vast majority of cadets attending these camps are mature men, college seniors and combat veterans, who have gone through the recruit or boot mill and take a dim view of repeating recruit training and instruction under, in some cases, noncombat noncommissioned officer instructors. These lads in some instances adhere to the old Army "treat 'em rough" policy. Veterans are the dominating influence on all campuses as they far outnumber other students and, being more mature, assume leadership. If the veteran association on the campus is won over from its wartime aversion to all things military, the task of enrollment and integration is simple. Summer camp cadets should not be neglected nor should they be pampered, but they should get the best on-job impression of the Army that is practical. Camp commanders should encourage social activities participated in by officers and ladies of the post.

E. Revision of the antiquated ROTC "commutation" or "issue in kind" uniform system. Uniforms should be issued to cadets and become the property of cadets upon successful completion of the Advanced Course and receipt of commission whether "commutation" or "issue in kind." Cadets would consequently take greater pride in wearing the uniform and greater care in maintaining it, if they knew this uniform was to become their own property and can be worn as required at paid ORC meetings, or provide a work uniform after integration in the Regular Establishment. A nominal price might be charged the cadet, such as the uniform's rag value, which is its true value after four years of wear under the present system.

F. Members of the Regular Army integration boards should exercise good judgment in selecting prospective officers and, as they must depend upon records and see the candidates for a brief period. At best, they should rely heavily upon the recommendations of the PMS&T's who see the candidates daily for from two to four years.

G. Indoctrination of medical officers in analyzing medical records of candidates. We have lost many excellent all-conference athletes who were turned down for a few pounds over or under weight, infant diseases and other apparently minor causes, *i.e.:* Frank Williams, 220-pound, 6'2" Captain of our 1948 Conference Football Champions, who was nominated for a Regular Air Force appointment but was turned down physically and has been forced to earn a living as first string defensive fullback for the New York Giants for the past two years.

H. Expedite promulgation of Regular Army assignment orders by the Adjutant General, Department of the Army. These orders sometimes lag two to three months after graduation and many candidates with no gainful means of support become impatient and accept temporary employment which in some cases expands into permanent employment and the loss of the individual to the Armed Services.

II. *CAMPUS AND COMMUNITY*

As the success of the ROTC program and subsequent integration project is measured by the quantity and quality of officers produced, the primary objective of all concerned should be to procure the greatest number of qualified students for screening and final enrollment. This enables maintenance of high standards in ROTC and in subsequent selection of Regular Army candidates.

The "open sesame" of ROTC success on any campus is *make the Military Department a useful and integral part of the college and community and do all things pertaining to that end.*

A. By actually participating in, sustaining and personally attending all college and community official and social activities.

B. By knowing and gaining the confidence of key men on the faculty and in the community. Many present troubles of PMS&T's on various campuses are due to the PMS&T's failing to implement this policy. Such difficulties as poor classrooms and facilities, unpopular class hours, disproportionate credit for military work can be eliminated by diplomacy and tact. Every opportunity should be taken to present the rich offerings of military training to the college and community authorities.

C. The PMS&T and staff should invariably attend general faculty meetings and continuously present the advantages of ROTC training to the faculty at large.

D. The PMS&T should secure the appointment of a member of his staff on each of the governing faculty committees to see that military training gets recognition in all things. Such committees as "Scheduling," "Attendance and Scholarship," "Credits," "Awards and Honors," "Housing," "Registration," "Publications," "Social Affairs" are only a few.

E. The PMS&T should get a member of his staff in each service and veteran club in the college and community and provide judges of various college and community competitions. The PMS&T should arrange to appear before the various faculty student advisors at their preregistration orientation and insure that faculty advisors will sell ROTC and include the item of ROTC on all their check lists and registration cards.

F. The PMS&T should encourage members of his staff to act as faculty advisors in as many fraternities and campus clubs as possible. Officers and wives should always be available as sponsors and patrons, at student body dances and parties.

G. Members of the Military Department should be available at all times as public speakers. Although the subjects covered vary, there should always be a strong plug for ROTC and ROTC-Regular Army advantages. This Unit averages 150 such talks a year throughout Utah and Idaho.

H. A program of talks by prominent military personnel such as visiting inspectors and the commanders of adjacent posts, depots and air fields should be arranged for cadets of the corresponding ROTC unit. Visits of inspection to adjoining posts, depots and fields can be arranged for distinguished military students to include functional as well as social activities.

I. The PMS&T should write personal letters to as many high school graduates and prospective veteran college enrollees as he can obtain addresses for, extolling the virtues of the college, ROTC, and Regular Army. We get out about 5000 of these every summer to addresses obtained from the college registrar as well as enrolled cadets.

J. The PMS&T, or members of his staff, should visit and personally address feeder high school assemblies and should be included in all proselyting parties sent out by the college. The PMS&T should make arrangements to appear before each of the college career conferences in order that the advantages and opportunities of ROTC and a military career be brought forcibly to the minds of all students.

K. The public information officer should keep ROTC and the advantages of a military career constantly before the public by timely, meaty and personal press and radio releases in campus, community and state organs.

L. The Military Department should hold frequent open houses for faculty, parents, students, Boy Scouts and community civic and veteran organizations.

M. Quasi-military organizations such as Scabbard & Blade, Pershing Rifles, and corps of co-ed sponsors should be brought to top efficiency and should eventually contain all key men and women on the campus. These outfits should appear in all college and community activities and the individuals should be indoctrinated with the advantages of a military career.

N. Training should be closely supervised and should equal or surpass those academic standards of other departments of the college. The latest approved and well established trends and techniques in teaching should be adhered to, and frequent instructor exchange visits should be arranged with other departments of the college. As a result of these visits all departments in this institution requested and are presently using with much appreciation FM 21-250 "Army Instruction."

The instructor-student relationship should not be that of an officer-enlisted man. The members of the Military Department should set an example in appearance, bearing and behavior at all times.

O. All class presentations should be previewed and critiqued by the PMS&T or his unit director. All cadets should be given an opportunity to constructively criticize the regular instructors during a given course. The PMS&T should spend a minimum of time in his office and a maximum of time supervising classroom instruction.

P. During authorized "PMS&T Time" in the spring quarter, the PMS&T should personally conduct a course in "Customs and Traditions of the Officers' Corps" for all 2d year advanced cadets. This course, based upon Moss' Officer's Manual and personal experience, has been reported to be very desirable by recent graduates now in the service.

Q. The PMS&T should arrange with the college authorities for a B.S. degree in Military Science based upon a major in that subject. There should also be a minor in Military Science authorized by the college authorities. The courses of these majors and minors should follow as closely as practical the standard course at West Point with emphasis on mathematics and the sciences. These majors and minors may or may not be a prerequisite for selection of distinguished military graduates, or those in above group recommended for Regular Army commissions.

R. The PMS&T should arrange with the college awards and Honors Committee for the allotment of a proportionate number of scholarships and other awards and honors to cadets. He should arrange with community leaders and presidents of community service and veteran clubs for medals and plaques to be awarded annually to cadets.

S. The PMS&T should encourage rifle and pistol marksmanship, not only in the cadets and corps of sponsors, but also arrange for faculty and community rifle and pistol clubs to use the Military Department range; this to include high school, Boy Scouts and Air Scouts.

T. The PMS&T should utilize all the means at hand to attain his mission and, being the senior officer in a locality, should make his office an unofficial military headquarters for the community. He should pool the resources of all civilian component training agents in the community without regard to branch, service or component and see that these agents are thoroughly indoctrinated with the principle of making their agency an integral and useful part of the college and community.

U. The PMS&T should cultivate the friendship and cooperation of adjacent post, depot and air field commanders with a view of obtaining the use of their various facilities, to include supplies on temporary memorandum receipt, such

as, busses, trucks, tentage, typewriters, mess equipment, dance decorations. He will find in most localities that these commanders are already grouped together in a semiofficial-social council, and the PMS&T should seek membership and actively participate therein for obvious reasons.

V. Unification:

1. "One for all—all for one." All military personnel, training aids, classrooms and transportation and other facilities on the campus, regardless of assignment to the air or ground forces, arm or service, should be pooled at the disposition of the ROTC coordinator for the accomplishment of the ROTC training mission within, of course, the limitations of the technical requirements of the various forces, arms and services.

2. Means are at the best limited, and the above policy not only lightens routine duties, but permits the most effective use of training aids as well as the most effective assignment of "round pegs" to "round holes" in instructional as well as administrative duties.

3. The unification principle should obtain also in all social, athletic, recreational activities, particularly in the establishment and encouragement of one officers' club, one noncommissioned officers' club and one women's club for all the forces and branches.

W. Due to extensive extracurricular activities "clock punching" for all instructors should be eliminated and these officers and men should be free to come and go at will providing that they produce results. Duty hours for administrative and supply personnel should be from 8:00 a.m. to 5:00 p.m. daily and until noon Saturdays. The number of latter personnel should be kept to an absolute minimum and changed at the end of each school year. By judicial use of all available personnel, off-duty hours and days can be arranged for all personnel, and every break should be sought and given the hard-working members of the staff.

X. Selection of force, arm or service should be elected by the individual cadet according to academic background requirements and in proportion to authorized enrollment quota of the individual force, arm or service. Once the cadet has committed himself, pride in the force, arm or service selected should be continuously built up and encouraged.

Y. Officers and noncommissioned officers (as well as wives) of the Military Department should be thoroughly indoctrinated with the fact that they have the privilege of being at a civilian educational institution because of their qualifications to be of service to the college and student body as well as the Armed Forces; that duty comes before self; that members of the Military Department are not clock punchers and in no instance will the "whistle" cause them to postpone or avoid service; that a harsh attitude toward cadets will not be tolerated and courtesy will invariably rule in all dealings with members of the college and community; that the Army wants junior officers and "honey catches more flies than vinegar."

Z. The personnel, matériel and facilities, including the brigade of cadets and the corps of sponsors of the Military Department at all times should be at the disposal of the college authorities to further all college projects from moving trees and buildings to conducting graduation processions and ceremonies.

III. *MISCELLANEOUS*

A. Under the supervision of the Regular Military staff, cadet brigade, regimental and battalion commanders and staffs should perform all command and staff functions of drill, ceremonies and demonstrations, wherein cadets appear. Cadet officers should be given the status of junior officers and held strictly to consequent responsibility.

B. For little cost an 8mm and 16mm training movie can be produced locally to indoctrinate as well as inspire newly enrolled freshmen cadets. The scenes of this movie should show various campus "big shots" and athletes going through the various ROTC drills from basic recruit to graduation parade. This provides the novice a definite goal with the steps as well as the end product of ROTC training.

C. Inasmuch as a great many seniors and veterans are now married or get married in college and their wives, through erroneous preconceived ideas regarding Army life, become the principal stumbling blocks to Regular Army integration, arrangements should be made to include as many cadets and wives as possible in Military Department social affairs.

D. All members of the military staff should be encouraged to sponsor informal get-togethers such as teas and breakfasts, where cadets' wives and officers' wives will have an opportunity to get together woman to woman and talk Army life. In particular, all distinguished military students' wives should be exposed to this treatment and military staff wives should be thoroughly indoctrinated with this policy and be available in their homes for appointments to sell the Army to cadet wives.

E. Arrangements should be made to have groups of the distinguished military students and their wives invited to attend officers' club dances at adjoining posts. Every effort should be made to maintain the status of the junior student officers both socially and officially in the minds of cadets.

F. The "pay-off" of the entire ROTC program is the quality and quantity of Reserve officers produced and Regular Army officers integrated. The advantages of a military career should be continually presented to the cadets from matriculation to graduation.

It is admitted that some of the above A-Z items take quite a bit of doing, and perhaps violent exception will be taken to many of them, but officers and men on ROTC duty who are not willing to put their hearts and souls into their jobs and who will not enthusiastically cooperate in the above policy should be immediately relieved to line duty without prejudice. ROTC duty is an enviable one and provides many advantages in addition to a permanent type of existence which does not obtain in the present-day hand-to-mouth existence of the Army at large.

It is believed that the task assigned the coordinator of ROTC affairs at an educational institution is the most interesting and productive that the peacetime establishment affords, providing the coordinator adopts a "can do" attitude and seeks not to find obstacles but to overcome them. This requires a lot of hard work as well as diplomacy, resource and foresight, but it has been my experience that this is just what all military jobs require, if one is to get the reward that comes from the innermost knowledge and satisfaction of a job well done.

AAA Protection Of A River Crossing—Remagen

By Lt. Col. C. G. Patterson, GSC (CAC)

At 1430, 7 March 1945, Combat Command B, 9th Armored Division, reached the Rhine at Remagen, captured the Ludendorff R.R. Bridge intact, and began establishing a bridgehead on the east bank of the river. This action in breaching the line of the Rhine for the first time in modern history, immediately changed the situation on the western front. The First Army, instead of occupying the Rhineland while the Third Army and British 21 Army Group made assault crossings of the Rhine, became the initial Allied spearhead into the heart of Germany.

Unlike a carefully planned river crossing against a strong enemy position, there was no opportunity to build up an AAA defense in depth on the near shore prior to the crossing. While the contingency of capturing a bridge had been foreseen and general plans made for exploitation, the tactical situation did not warrant uncovering important objectives until such time as a bridge had been secured. However, on 1 March all AAA units were alerted to the plan for concentrating First Army AAA resources if and when the rapidly retreating Nazi Army should fail to destroy all bridges. The AAA group commanders of the III, V, and VII Corps were advised that when the necessity arose, the AAA units defending the crossings of the ROER River, airfields, and all other Army areas would be made available to augment the automatic weapons units within their corps. Since the rapidly declining Luftwaffe, hampered by the loss of bases, poor communications, limited gasoline supplies, and overwhelming Allied air superiority, required 36 to 48 hours to react in strength to the capture of sensitive points, it was felt that an initial defense with automatic weapons could cope with the expected small-scale attacks which would be low level and dive-bombing.

The 482d AAA AW Battalion (SP), attached to the 9th Armored Division, established the initial AAA defense—and for the next ten days performed their mission in an outstanding manner, while sitting at the center of impact of all the artillery fire aimed at the bridge. The road net from the Roer to Remagen presented a difficult problem—one narrow road over which to move up the engineer bridges, the divisions to exploit the crossing, and the AAA units to defend the bridges against air and water borne attack. AAA units were alerted and placed in readiness to take advantage of every available road space, even if only one battery at a time could be moved. Colonel J. H. Madison, C.O., 16th AAA Group, placed units in a coordinated defense in building up the defenses. By 14 March, the defenses consisted of four AAA gun battalions, nine AAA automatic weapons battalions, Flight "A," 974 RAF Balloon Squadron (see map), and were supported by an additional nine AAA automatic weapons battalions, deployed covering the approaches and troop concentrations on both sides of the river. Under this AAA umbrella and continual daylight fighter cover, additional bridges were constructed, and the bridgehead built up by expanding north and south from the original crossing. By 17 March, when the bridge, weakened by artillery hits, collapsed while under repair, there had been no traffic on the Ludendorff Bridge for three days—the engineer bridges were carrying the traffic.

Despite repeated suicide efforts by the Luftwaffe beginning with an attack by four JU-87 dive bombers on 8 March, and building up to 91 attacking aircraft (mostly jet Me262s) on 14-15 March, not a single hit was registered on the bridge. One 500-pound bomb landed on the western approach, jettisoned by an Me 109 which had been hit by AAA fire, but the damage was repaired by a bulldozer in a few minutes. Of the 372 enemy aircraft which attacked the bridge from altitudes below our fighter cover, 63 (16.9%) were confirmed as destroyed and 36 (9.7%) were confirmed as probably destroyed by the AAA defenses. By agreement with the Commanding General, IX Tactical Air Command, prior to the establishment of an inner artillery zone, fighters remained outside the AAA defended area or above 5000 feet over the bridge area during daylight hours. As of 1900, 9 March, an inner artillery zone was established, centered on the Remagen Bridge with a 15000-yard radius up to 10,000 feet. Barrage balloons were flown day and night at 2000 feet in an uncontrolled barrage. All aircraft, including liaison type, were directed not to approach the bridges. Minimum safety angle restrictions on automatic weapons were removed in order to permit firing on aircraft attempting to attack just off the water and to enable firing on swimmers or other water borne attacks.

In addition, for the first time in the First Army, a night automatic weapons barrage plan was placed in effect. Based on data provided to the group sub-operations room by the gun battalion SCR 584s, a high or low barrage was fired on orders of the group commander all automatic weapons firing in the direction of the bridge. Different elevations

were prescribed for weapons located within 1000, 2000, 3000, 4000, and 5000 yard zones from the bridge. On the command to fire the barrage, each fire unit opened fire for 10 seconds while traversing slowly five degrees either side of the designated points. By assigning different quadrant elevations for the 40s, 37s and 50 cal. in each zone, better coverage was provided. While the ammunition expenditure was exorbitant, and no claims for aircraft destroyed were confirmed, no enemy aircraft penetrated the barrage to drop bombs on or near the bridges. Needless to say, the barrage balloons suffered exceptionally heavy casualties and there were a number of personnel casualties from falling fragments. The thousands of tracer streams must have been a discouraging welcome to even the most intrepid pilot.

While the fighter-AAA team provided a virtually impregnable defense against the limited air effort the Luftwaffe could muster, there was always the threat of water borne attack by swimmers, floating demolition charges, or other means. Automatic weapons sighted along the river, augmented by Battery "C," 226th AAA Searchlight Bn. for night illumination, maintained a water surveillance along the Rhine in the bridge areas. On 25 March, the 49th AAA Brigade under Brigadier General E. W. Timberlake assumed responsibility for the AAA defenses of the river crossings in the First Army area. At the same time all units involved in security of the bridges against any type of attack were attached to the 49th Brigade. Even though the Luftwaffe attack decreased in numbers after 15 March, there was always the threat of one last suicide attempt to take out the bridges—that is until the junction of the First

and Ninth Armies on 1 April effectively closed off the Ruhr pocket.

Against the last futile efforts of an already beaten and not too aggressive enemy air force, the AAA plan of action produced the desired results. Flexibility in planning and the rapid exploitation of a bridge left standing, enabled the First Army to achieve optimum results. While from an AAA point of view, a more rapid build-up of the defenses might have been more desirable, the Army commander could not grant priority to the AAA build-up at the expense of bridging operations or strengthening the ground combat forces in the bridgehead. This is a command responsibility —the decision must be based on the situation as it exists, rather than undeviating adherence to a doctrine. Based on the estimated capabilities of a declining enemy air potential, and the attack pattern which had not varied in nearly ten months of combat, there is no question that the decision was a sound one. The results attained are indicative of the soundness of the decision.

Faced with a different set of circumstances, and opposed by an air force capable of mounting rapid and effective strikes, it may well be necessary in future operations for additional AAA strength to be pushed forward at the expense of other combat forces. However, as in the past, the responsible commander must make his decision based on his estimate of the situation.

Great Advance In Radar and Television Promised By Signal Corps "G-String"

A revolutionary telephone and television transmission line having many industrial and military uses was announced by the U.S. Army Signal Corps at the annual convention of the Institute of Radio Engineers in New York City.

The line, which is simple, highly efficient, and costs little to manufacture, promises to open up wholly new possibilities in microwaves and home television. It is a single wire with special insulation and funnel-shaped terminals.

Inventor of the line is 43-year-old Dr. Georg Goubau of the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey.

The Signal Corps, which calls the device a "G-string" after the inventor's initials, expects it to bring important improvements to radar operation. It also may replace coaxial cable, which is both intricate and expensive, for many applications.

One immediate use of Dr. Goubau's G-string may be as an inexpensive means of distributing television programs to city homes on a "wired wireless" basis—at present prohibitively high in cost. It also may be possible to pipe television programs at relatively low cost to areas of the United States now out of television range; for instance, to midwestern farm belts.

The G-String also may make practical, engineers said, the development of a videophone, by which a telephone subscriber could go to his local exchange, pick up an instrument, and talk to a friend across the continent—and both parties see each other. The new Signal Corps line could carry a hundred such videophone conversations simultaneously on a single wire, compared with the ability of today's single coaxial cable to carry only one.

Engineers also pointed out that, though this discovery will be of civilian use, it will be even more important to the Armed Forces. The new transmission line is likely to change many radar techniques and simplify the difficult problem of feeding power to rotating antennas. In addition, it will aid military microwave relay techniques through greatly improved transmission of energy from set to antenna, thus increasing its power and range. It will permit communications never before available to an Army.

HONOR ROLL

****88th Antiaircraft Airborne Battalion**
April 1949—Lt. Col. Page E. Smith

****11th Antiaircraft Artillery AW Battalion (SP)**
May 1949—Lt. Col. Roy A. Tate

****228th Antiaircraft Artillery Group**
July 1949—Col. David W. Bethea, Jr., S.C.N.G.

****107th Antiaircraft Artillery AW Battalion (M)**
July 1949—Lt. Col. Thomas H. Pope, Jr., S.C.N.G.

***713th Antiaircraft Artillery Gun Battalion (M)**
July 1949—Maj. W. B. Pollard, Jr., S.C.N.G.

****260th Antiaircraft Artillery Gun Battalion (M)**
July 1949—Maj. Archie C. Watson, Jr., D.C.N.G.

678th Antiaircraft Artillery AW Battalion (M)
July 1949—Lt. Col. M. T. Sullivan, S.C.N.G.

****305th Antiaircraft Artillery Group**
August 1949—Col. John S. Mayer, N.Y., O.R.C.

****21st Antiaircraft Artillery AW Battalion (SP)**
October 1949—Maj. John F. Reagan

****59th Antiaircraft Artillery Battalion (SP)**
October 1949—Lt. Col. Landon A. Witt

****69th Antiaircraft Artillery Gun Battalion (M)**
October 1949—Lt. Col. Alfred Virag

***101st Antiaircraft Artillery Gun Battalion (M)**
December 1949—Lt. Col. Henry J. Ellis, Ga. N.G.

****19th Antiaircraft Artillery Group**
December 1949—Col. George R. Carey

****39th Antiaircraft Artillery AW Battalion (M)**
January 1950—Lt. Col. Edward T. Ashworth

****4th Antiaircraft Artillery AW Battalion (M)**
January 1950—Lt. Col. Ernest L. Bush

****503d Antiaircraft Artillery Operations Detachment**
January 1950—1st Lt. Peter C. Sweers, Jr.

****75th Antiaircraft Artillery Gun Battalion**
January 1950—Lt. Col. John F. Ballentine

***40th Antiaircraft Artillery Brigade**
January 1950—Col. Morris C. Handwerk

***62d Antiaircraft Artillery AW Battalion (SP)**
January 1950—Lt. Col. Arthur F. Schaefer

****226th Antiaircraft Artillery Group**
January 1950—Col. John D. Sides, Ala. N.G.

****146th Antiaircraft Artillery AW Battalion (SP)**
February 1950—Lt. Col. R. H. Franklin, Mich. N.G.

****70th Antiaircraft Artillery Gun Battalion**
March 1950—Lt. Col. Francis Gregory

****68th AAA Gun Battalion**
March 1950—Lt. Col. Raymond C. Cheal

The List Grows!

1. To qualify for a listing on the JOURNAL Honor Roll, units must submit the names of subscribers and total number of officers assigned to the unit on date of application.
2. Battalions with 80% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than 20 officers.
3. Brigades and groups with 90% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than seven officers.
4. Units will remain on the Honor Roll for one year even though they fall below the 80% requirement during the year.
5. Lists of subscribers and statement of number of assigned officers must be submitted annually by units in order to remain on the Honor Roll.
6. Battalions with 90% of officers subscribing will qualify for one star placed after the unit's designation on the Honor Roll. Battalions with 100% subscribers will qualify for two stars.
7. Groups and brigades cannot qualify for one star but may qualify for two stars by having 100% subscribers.

(Units of all components will be listed together in the order of their percentages, beginning with the unit with the highest percentage.)

(Each unit listed on the Honor Roll will be given a one-year complimentary subscription to the JOURNAL.)

(Name of unit commander and date unit initially qualified for the Honor Roll will be listed with the designation of the unit.)

MIDNIGHT OIL FOR REDLEG LAMPS

By Lt. Col. Dale E. Means, FA and Major Raymond J. Wilson, Jr., FA

With much of the training at The Artillery School divided between Fort Sill and Fort Bliss, subjects dealing with Antiaircraft Artillery and Guided Missiles are prepared at Fort Bliss although the over-all administrative functions connected with the extension courses are conducted at Fort Sill.

Not long ago, Sunday morning funny paper readers smiled as they watched former Sgt. George Baker's immortal Sad Sack struggling simultaneously with a perplexing correspondence course and the lure of a nearby taxi dance hall. No one who has ever used *Yank* to help him through the graveyard trick in a fire-direction center, needs to be told which of Sack's two natures prevailed. By the end of the strip, however, virtue and extension courses had triumphed—after, it must be admitted, the visioned lovelies had proved plain, curveless, and expensive—and Sack was back at his desk making good use of his time.

Happily, most students enrolled in extension courses at The Artillery School, show much the same moral fortitude as Sack and whatever the distraction, eventually get back to their lessons. Frequently, however, it is possible for the extension course instructor to determine that a lesson was started on a certain day and not finished until some months later. The early arrival of a new baby in the midst of Lesson 4, Subcourse 40-10, "Field Artillery Tactics, General," postponed the completion of the lesson by one National Gard captain until months later, when the new arrival was off the 0200 feeding.

But this is not the general case. The majority of the students now enrolled in the Department of Extension Courses at Fort Sill manage to keep their work flowing in. The school has managed to keep the preparation of the correspondence courses ahead of all but a few of the energetic students.

The task of preparing the courses has been a longer job than was originally anticipated. The principal reasons for the delay have been changes and improvements in the doctrines and techniques of artillery based on World War II experience and postwar developments and experiment. Field Artillery Gunnery is a case in point. No sooner had the courses in the range- and deflection-bracketing procedure come "on the market" (as Department slang has it) than the Chief, Army Field Forces approved the new gunnery methods based on the use of the target grid. This forward step necessitated a complete rewrite of all the gunnery subcourses except the one on survey.

These delays and others, such as heavy printing loads at the field printing plant at Fort Sill, have gradually been overcome. It can be foreseen that in a few months, almost the entire program will be available to students.

The present extension course enrollment at The Artillery School is approximately 11,000. This total is composed of a number of clearly identifiable groups, each with its own particular reason for pursuing military education by mail.

Student Motivations

A large number of students are enrolled, primarily to keep abreast of the advances in military techniques especially as these advances apply to the artillery. Since the close of World War II, the combat experience of our forces has been intensively studied and evaluated. In addition, new equipment has been developed. As a result of this study and development the whole body of artillery doctrine has been re-examined, and changed where applicable. The remainder has been at least restated with emphasis in new places. These changes have been incorporated in new field manuals now in the process of being published and are, of course, included in the resident instruction given in the regular and associate courses of The Artillery School.

The extension courses program parallels resident instruction so far as practicable and as the courses have been written, the latest doctrine has been included. Obviously, officers who have had no artillery experience since the war need some method of getting up-to-date and keeping up-to-date on the latest developments. Nearly every week there can be noted officers of the civilian components who do not realize that the light field artillery battery contains six howitzers. Furthermore the majority of these officers have had little contact with the new target grid methods of observed fire and fire direction. Extension courses provide a good way to keep abreast. There are other ways, of course—summer camps, attendance at service schools, troop schools, and unit training periods. For a large group, however, summer camps are hard to fit in, and attendance at service schools is impossible.

Experience has shown that the officers of the Reserve and National Guard are hungry for this information. In the spring of the year dozens of letters are received from students who plan to attend National Guard or Reserve summer camps. These students want help in the selection of courses which will prepare them for their two weeks work in the field. Unit commanders in the civilian components are also good "customers." Many of them find that extension courses help them attain and keep the knowledge they need to "swing" their jobs. Some of them require the officers charged with unit instruction to acquire an adequate background, by taking the appropriate extension courses.

Extension courses are intended for the officers of all components of the Army, not merely the civilian components. Regular officers and officers on extended active duty, find

Extension Course Program of The Artillery School—1949-1950, 1950-1951

20 Series

Subcourse Number New	(Old)	Title	Credit Hours* FA	AA	Opt
20-1	(20-1)	Map and Aerial Photograph Reading—II	20	20	
20-2	(20-2)	Methods of Instruction	14	14	
20-3	(20-3)	Military Law—Courts-Martial	30	30	
20-4	(20-5)	Motor Vehicle Operation and Maintenance	20	20	
20-5	(20-6)	Artillery Matériel and Ammunition	16	16	
20-6	(20-8)	Basic Artillery Gunnery	11	11	
20-7	(20-9)	Basic Artillery Communication	12	12	
20-8	(20-11)	Recognition of Artillery Targets	12	12	
20-9FA	(20-12FA)	Firing Battery	21		
20-10FA	(20-13FA) (30-13FA)	Conduct of Observed Fire	16		
20-11AAA	(20-15AAA)	**AAA Matériel-Guns (1951)			17
20-12AAA	(20-16AAA)	AAA Matériel-Automatic Weapons		18	
20-13AAA	(20-17AAA)	AAA Basic Gunnery		18	
20-14FA	(20-21FA)	Air Navigation			19
		Total Credit Hours	172	171	

30 Series

Subcourse Number New	(Old)	Title	Credit Hours* FA	AA	Opt
30-1	(30-1)	Administration—II*	23		
30-2	(30-2)	Training Management	12	12	
30-3	(30-3)	Terrain Evaluation	13	13	
30-4	(30-4)	Artillery Survey	18	18	
30-5	(20-4)	Mess Management*	18		
30-6	(20-7)	**Infantry Tactics, the Co. (Nov. 1950)	20	20	
30-7	(20-10)	Basic Electricity	27	27	
30-8	(None)	**Leadership—I	12	12	
30-9	(30-8)	Artillery Intelligence	19	19	
30-10FA	(30-10FA)	Field Artillery Signal Communication	12		
30-11FA	(30-12FA)	Map and Aerial Photograph Reading for Field Artillery	22		
30-12FA	(30-14FA)	**Fire-Direction Center Technique (Oct. 1950)	22		
30-13FA	(30-11FA)	Unobserved Fire	22		
30-14AAA	(30-15AAA)	Electronics		30	
30-15AAA	(30-16AAA)	Employment of AAA Radar		27	
30-16AAA	(30-17AAA)	**Fire Control—AAA Guns		21	
30-17AAA	(30-18AAA)	**Advanced Gunnery—AAA Guns		23	
30-18AAA	(30-19AAA)	AAA Advanced Gunnery and Fire Control, Automatic Weapons		25	
30-19	(30-22SC)	**Celestial Orientation for Artillery (1951)			18
30-20FA	(30-26FA)	Field Artillery Meteorology			32
30-21FA	(30-27FA)	Meteorology for Light Aviation			20
		Total Credit Hours	240	247	

40 Series

Subcourse Number New	(Old)	Title	Credit Hours* FA	AA	Opt
40-1	(40-1)	Map and Aerial Photograph Reading—III	16	16	
40-2	(40-2)	Rules of Land Warfare	16	16	
40-3	(40-3)	Military Government	20	20	
40-4	(40-4)	Combat Intelligence—III	20	20	
40-5	(40-5)	**Guided Missiles—General (1951)	25	25	
40-6	(30-6)	**Hasty Field Fortifications and Obstacles	18	18	
40-7	(30-5)	**Infantry Tactics, the Battalion (July 1950)	20	20	
40-8	(40-6)	**Infantry Tactics, the Regiment (Oct. 1950)	20	20	
40-9	(30-9)	**AAA Tactics—General (Nov. 1950)	20	20	
40-10	(40-10)	Field Artillery Tactics—General	19	19	
40-11	(40-11)	RSOP	17	17	
40-12	(30-7)	Troop Movement and Bivouac	17	17	
40-13	(40-7)	Staff Functions	12	12	
40-14	(40-8)	**Operation Orders (Aug. 1950)	13	13	
40-15	(40-9)	Supply in Combat	12	12	
40-16	(None)	**Leadership—II	12	12	
40-17FA	(40-12FA)	Self-Propelled Artillery	14		
40-18FA	(40-13FA)	Field Artillery in Offensive Action	22		
40-19FA	(40-14FA)	Field Artillery in Defensive Action	16		
40-20FA	(40-15FA)	Employment of Light Aviation—Ground Units	16		
40-21AAA	(40-16AAA)	**AAA Gun Battalion (Jun. 50)		20	
40-22AAA	(40-17AAA)	**AAA Automatic Weapons Battalion (Sept. 50)		20	
40-23AAA	(40-19AAA)	**AAAIS and AAOC (1951)		21	
40-24AAA	(50-8AAA)	**AAA Target Practice Analysis (1951)		15	
40-25	(40-18AAA)	**AAA in a Surface Role (Nov. 50)	25	25	
40-26FA	(40-24FA)	Sound and Flash Ranging			22
		Total Credit Hours	370	378	

50 Series

Subcourse Number New	(Old)	Title	Credit Hours* FA	AA	Opt
50-1FA	(50-1FA)	Division Artillery in Offensive Action	23		
50-2FA	(50-2FA)	Division Artillery in Defensive Action	20		
50-3FA	(50-3FA)	Corps and Army Artillery			20
50-4FA	(50-4FA)	Artillery with the Corps in Offensive Action	13		
50-5FA	(50-5)	**Artillery with the Corps in Defensive Action (1951)	17		
50-6AAA	(50-6AAA)	AAA Brigade, Group and their Staffs		20	
50-7AAA	(50-7AAA)	**AAA with Division, Corps and Army (Oct. 50)		18	
50-8AAA	(50-9AAA)	**Flak Analysis (Sept. 50)		24	
50-9AAA	(50-10AAA)	**Employment of Guided Missiles (1951)		12	
50-10AAA	(50-15AAA)	**Statistical Research and Analysis (1951)			27
		Total Credit Hours	73	74	

When the student has completed the subcourses listed above, which are currently available, the school will transfer him to the Command and General Staff College where he will pursue subcourses as follows:

Subcourse Number C&GSC	TAS	Title
1	50-11	Command and Staff Functions—Division.
2	50-12	Tactical Principles and Control Methods—Division.
3	50-13	Special Staff Sections—Division.
4	50-14	Personnel Section—Division.
5	50-15	Intelligence Section—Division.
6	50-16	Operations Section—Division.
7	50-17	Logistics Section—Division.
8	50-18	Staff Cooperation and Coordination—Division.

60 Series

All courses of the 60 series are administered at the Command and General Staff College. However, applications for enrollment from artillery students must be forwarded through The Artillery School. The program is as follows:

Subcourse Number C&GSC	TAS	Title
11	60-1	Principles of Military Leadership.
12	60-2	Tactical Principles and Decisions I.
13	60-3	Tactical Principles and Decisions II.
14	60-4	Tactical Principles and Decisions III.
15	60-5	Tactical Principles and Decisions IV.
16	60-6	Tactical Principles and Decisions V.
17	60-7	Troop Leading: Command, Staff and Logistics.
18	60-8	The Army Information Program—Public Information and Troop Information and Education.
41	60-9	The Army Area.
42	60-10	The Advance Section.
43	60-11	The Base Section.
44	60-12	The Communications Zone.
46	60-13	Support of Airborne Operations.
47	60-14	The Theater.
48	60-15	The Zone of Interior.

All of the above 60 series subcourses are currently available except No. 11 (60-1), Principles of Military Leadership.

*Optional for AAA officers.

**Indicates subcourse is not now available. Estimated date of availability, if known with reasonable certainty, is shown in parenthesis following title.

them to be of value and many are enrolled. "I had a G-4 job right after the war and since then I have been in Military Government," is a typical statement in letters applying for "Conduct of Observed Fire," the new course on the target grid method of shooting observed fires.

A number of other more immediately discernible, but perhaps less important results accrue from the study of extension courses.

The final grade of an extension course becomes part of the permanent record of a Reserve or National Guard officer. Obviously, this record is of considerable value to commanders when an individual is being considered for promotion, selection for service school, and call to extended active duty.

Extension courses also provide an excellent means to earn retirement credits and to keep eligible for active reserve status. Under current regulations, three credit hours of extension course work are equivalent to one retirement credit point. Many officers who find it difficult to attend unit drills because of their location, find extension courses their principal means of keeping eligible and earning retirement points. The Artillery School has on its rolls any number of forest rangers, oil field workers, foreign representatives of U.S. concerns, construction engineers, and traveling salesmen who get little chance to earn retirement credits through unit drills. Extension courses also satisfy some reserve promotion requirements for officers unable to obtain appropriate T/O assignments.

Enrollment regulations are quite flexible so that the educational needs of almost any individual can be met. In the usual case, a new enrollee is placed in the numbered series appropriate to his grade. For example, a captain will be enrolled in the 40 series. However, an officer with special needs may enroll in a special series appropriate to his own requirements. If an officer has applied for transfer to another branch he may take the appropriate courses in the school of the new branch. Officers on extended active duty may take any subcourse in any of the schools. Thus an artilleryman not only can catch up on his gunnery or RSOP, but can also learn infantry or tank tactics. When an officer has completed all the courses he needs at The Artillery School, he is transferred to the Command & General Staff College.

Most officers who were around before the war, recall that many enlisted men, particularly those in key positions, were encouraged by their commanders to prepare themselves for greater responsibilities by pursuing military correspondence courses. When World War II came along, many of these NCO's profited materially by their preparation and won advancements ranging from Second Lieutenant to full Colonel. The records of the Department of Extension Courses, TAS, reveal that very few Regular Army enlisted men are using this method of improving their artillery knowledge at the present time, although an appreciable number are enrolled at the Army General School. Commanders might well survey their outfits and urge promising noncommissioned officers and privates to enroll in extension courses. Enlisted men may enroll in the 10 series of any school. In addition, they are authorized to take courses in a higher series when their duties or prospective duties require special training.

Many good noncommissioned leaders are going to need technical help to enable them to climb the newly devised career ladders. The examinations in firing battery and gunnery subjects are thorough and require solid understanding of the subject matter. Enlisted men preparing for these subjects, will undoubtedly be helped by the study of the extension courses available on these subjects. The battery commander who has men worthy of promotion can help them by encouraging them to enroll in the subcourses appropriate to their career fields.

Techniques of Preparation

Since the initiation of the program in 1946, a major effort has been made to develop techniques of teaching by mail, which will impart the maximum amount of instruction per hour of student effort and yet be such that the student retains the learned material as long as possible.

Under procedures developed by the Department of Extension Courses, TAS, the student is first given an assignment for study in the text for the course. He is then required to place himself in a realistic tactical or training situation and finally to solve multiple-choice type, objective exercises based on the text assignment and the situation. An example follows:

SITUATION. You are S-3, 104th FA Group, attached to I Corps Artillery. Your group is composed of the 502d FA Bn (155 Gun SP), 405th FA Bn (8″ How Trac), and the 803d FA Bn (240 How Trac). You are planning fires in preparation for an attack.

EXERCISE: You determine that for indirect fire, the 8-inch howitzer, as opposed to the 155mm gun, is particularly suitable for:

(Select the *BEST* one.)

a. Interdicting a road junction.
b. Attack of infantry in the open.
c. Harassing a bivouac area.
d. Destruction of a pillbox.

SOLUTION: (Sent to student after exercise is graded; includes text references not given here.)

a. Interdiction fires are of relatively light intensity laid down on lines of communication to disrupt or intermittently deny their use to the enemy. Within the range of the weapons the 155mm gun and 8-inch howitzer are equally suitable for such missions.

b. Neither weapon is particularly suitable for neutralization of a target such as infantry in the open because it is not considered economical to use such large projectiles when lighter projectiles will do the job equally well. In addition, neutralization requires a rapid rate of fire. Heavy artillery has a much slower rate of fire than the lighter weapons.

c. The weapons are about equally suited for harassing fire, which is fire of less intensity than fire for neutralization. Unless there is some aspect of the target location such as deep defilade or extreme range, neither weapon could be said to be the better for this purpose.

d. The 8-inch howitzer is one of the most accurate field artillery weapons. At 18,000 yards the 155mm gun

has a range probable error of 43 yards, whereas the 8-inch howitzer has a range probable error of 19 yards. The 8-inch howitzer projectile, being twice as heavy as that of the 155mm gun, has a considerable advantage in explosive power. Using indirect fire, the accuracy of the piece, coupled with the explosive power, excellent penetration effect and high trajectory of the projectile, gives the 8-inch howitzer a definite advantage over the 155mm gun for destruction purposes.

It can be seen that this exercise requires the student to learn the range and accuracy characteristics of both the 8-inch howitzer and the 155mm gun, as well as the meaning and significance of the terms "interdiction," "harassing fires," "neutralization," and "destruction." Nowhere in the text will he find it stated that "destruction" is the "best" answer to the question posed by the exercise. But he can arrive at the solution by analysis of all the factors given above and applying the principles he has learned, to the particular problem presented. In this way, the student learns and retains the principles it is desired to teach him.

This type of exercise, in addition to teaching the student a great deal of material, saves him a great deal of time. This is an important consideration in extension courses where students must sandwich their work in between the tasks of making a living, enjoying normal family life, pursuing other military training, following hobbies, and getting in a share of social activities. In the sample above, it would be quite possible to teach the same principles to the student by asking the student to write an essay-type answer comparing the two weapons for use, in the four types of fire listed in the exercise. But this is a time-consuming process which adds little to the instruction. In the multiple-choice type exercise, he must make exactly the same *mental* comparison and analysis as he does in the essay type. Yet an "x" on the answer sheet allows him to record his solution instantaneously and be free immediately to go on to the next segment of instructional material. He is not forced to linger five to twenty minutes in the mechanical operation of recording solutions.

These techniques of presentation are based upon continuing studies made by officers of the Department of Extension Courses, TAS, beginning in 1946 and pursued until the present time. Civilian universities were visited, and various techniques of presenting written instructional materials were examined and analyzed. In the course of these studies, it was found that the use of any technique other than objective type questions, permitted too much subjectivity in the grading of student solutions. This is not possible in the multiple-choice type since the instructor also is bound by the carefully considered pre-worked solution. This makes for uniform grading, and prevents favoritism, one of the frequent criticisms of prewar extension courses.

In addition, some time and teaching value is found to be lost when the student fails to approach the problem in such a way as to derive the points the school wishes to teach him. Every teacher has had the experience of having a student turn in a beautifully reasoned discussion of some point other than the one raised by the question. The properly constructed multiple-choice exercise forces the student to learn the points the school wishes him to know.

Another advantage of this type of exercise is that it trains military students to make up their minds. In the essay type it is easy to straddle the fence or answer the question both ways—to hedge, in gambling terms. The multiple-choice exercise, forces him to make a decision and thus trains him in a valuable aspect of military leadership. A few students have, interestingly enough, complained of this aspect of the extension course program, saying that the multiple-choice exercise does not give them enough "leeway" in their answers. Surely such a student needs the benefit of this type of training.

It is interesting to note that while civilian experience in the multiple-choice type exercise has been largely confined to its use as a *testing* device, The Artillery School uses it as a *teaching* technique. Experiences in nearly four years of the use of the device have proved it to be of immense value in teaching military subjects and to be very popular with students who are relieved of long hours of arduous penmanship.

Instructor-Student Relationship

No effort is spared in the administration of the lessons to develop the instructor-student relationship. Despite the ease of grading multiple-choice exercises, considerable time is spent by the instructors in the grading of each lesson submitted. This is especially true when the student has low marks or is not making satisfactory progress. The instructor is known by name to each student. In addition to grading the paper, the instructor adds notes and suggestions to aid the student in mastering the subject matter. Instructors

How to Enroll

For information on enrollment in extension courses, see AR 350-300. For the program of all schools see D/A Pamphlet 20-100.

Application blanks (D/A AGO Form 145) may be obtained from any headquarters or by addressing a postcard to "Dept. of Extension Courses, The Artillery School, Fort Sill, Okla." Applications must be sent through military channels.

Series appropriate to grade:

Series	*Grade*
20	2d Lieutenant
30	1st Lieutenant
40	Captain
50	Major
60	Lieutenant Colonel

Some 50 series and all 60 series subcourses are administered by the Command and General Staff College. However, applications for enrollment of artillery students in courses administered by other schools must be forwarded to "The Artillery School." When applying, for specific subcourses, state the title as well as the number. Enlisted men enrolling in 10 series must apply to the Army General School, Fort Riley, Kansas.

are all officers especially well qualified in the subject matter of the courses in which they instruct. The majority at the present time are Regular officers of field grade. It is common practice for students to write notes and letters, asking questions and seeking help in the solving of some problem connected with their studies. These inquiries are always answered carefully and thoroughly. This personal attention is appreciated by most students, many of whom send thank-you notes at the end of the course. Last Christmas there wasn't a single instructor who didn't receive at least one Christmas card from a student.

Revision

With the initial preparation nearly completed, a program of revision has been started. From the very beginning in 1946, careful records have been kept of student grades in each exercise of every course. When these records show that over 25 per cent of the students make an improper choice or give the wrong answer, it is considered that the exercise has some flaw. The exercise is then studied and reworded or changed. Similarly, if the students' answers are unanimously correct, or nearly so, it is considered that the exercise requires little mental effort and thus has little teaching value. As rapidly as possible all "bugs" which appear (and some do appear despite careful editing) are cured by the publication of errata or by more complete revisions. Careful records are also kept of all student comments and the average time required to complete each subcourse. These comments, together with the record of student grades form the revision file kept on each subcourse. At an appropriate time each subcourse will be completely revised in view of all the information available; of course, the latest doctrine will be incorporated in each new revision.

By these procedures, The Artillery School believes that its extension courses will supply those who cannot attend its resident courses, an adequate, authoritative method of acquiring, and keeping fresh the knowledge they will need in the event of mobilization. This is a continuing effort. The initial preparation of subcourses, now nearing completion, is an important first step. Improvements will follow. Students enrolling in the program can be assured that personalized instruction, by the latest proved educational techniques, will reward them for the time they take from their personal lives to pursue their military education. The fainthearted, who persuade themselves that the effort isn't worth the gain, may take courage from the Sad Sack who stuck to his guns even in the face of the deadliest enemy of the extension course—the human female.

Part of Record-Breaking Army Rocket Recovered at White Sands

A major portion of the world's highest flying rocket, which reached an altitude of 250 miles last February and was previously believed to have burned like a meteor when it reentered the earth's atmosphere, has been found and is being studied by guided-missile scientists.

The Army Ordnance Department, and the General Electric Company, jointly responsible for the firing of the rocket, announced that the badly smashed body section, weighing about 200 pounds was recovered near the northern boundary of the White Sands Proving Ground range at Las Cruces, New Mexico.

Since it could not be found immediately after the firing on February 24, 1949, some believed that this body section, entering the atmosphere at enormous speed, must have burned like any shooting star.

The rocket in question was a two-stage rocket consisting of an Army-designed and built WAC Corporal rocket attached to the nose of a V2. At a height of about 20 miles, the small rocket was separated from the mother missile and sped away at a speed of 5,000 miles an hour to an altitude never before attained by any man-made device.

It was the part of the "WAC Corporal" body section that was found near the north end of the 116-mile range.

R. P. Haviland, General Electric Company project engineer who was in charge of the launching, said the tail section is being tested by the Jet Propulsion Laboratory of the California Institute of Technology in attempts to ascertain more fully what happened to it during its sortie far above the earth's atmosphere. Cal Tech and the Douglas Aircraft Company collaborated with General Electric, as contractors for the Ordnance Department, in the launching.

An electric switch, known as a "switchette," was among the pieces recovered. It was sent to Mr. Haviland, whose engineers originally installed it as part of the mechanism for discharging the "Corporal" from the V2. Although charred, and resembling a rusty hinge, Haviland said the switchette would function perfectly if its broken contacts were replaced.

ABOUT OUR AUTHORS

Colonel Donald J. Bailey, GSC, graduated from the U.S. Military Academy in 1925. He served in the European Theater from January 1944 to the end of the war where he commanded the 12th AAA Group whose battalions had one of the highest records on the Western Front for German planes shot down and for ground action. He was also AAA officer of the XIX Corps with the First and Ninth Armies. He is presently assigned to the Plans Section, OCAFF and is monitor of Joint Committee on doctrines and policies.

Colonel E. W. Timberlake, CAC, graduated from the U.S. Military Academy in 1917. He commanded the 49th AAA Brigade with the First Army in the European Theater and he is presently serving as PMS&T at Utah State Agricultural College, Logan, Utah.

Lieutenant Colonel C. G. Patterson, GSC, was Chief of the Plans Section, Antiaircraft Command, Eastern Defense Command and First Army from December 1941 to September 1943. He was Antiaircraft Officer of the First Army in Europe, the Pacific, and the U.S., from December 1943 to October 1945. He is now assigned to the Research and Development Board of the National Military Establishment.

Lieutenant Colonel John M. King is assigned to duty with the Office, Chief, Army Field Forces. He has had service as an enlisted man and an officer in the Maryland National Guard since 1932. During World War II, he served as commanding officer of the 397th Infantry Regiment of the 100th Division.

Lieutenant Colonel Leonard M. Orman is a steady contributor to the JOURNAL. After serving as an instructor in the Department of Electronics and Electricity at the United States Military Academy for a number of years, he is now attending the University of Pennsylvania.

Lieutenant Colonel Edward S. Berry is at present Assistant Director, Department of Combined Arms, The Artillery School. He was graduated from the USMA in 1930, from The Artillery School in 1935 and from the Command and General Staff College in 1947. He served with the 3d Armored Division during five campaigns in World War II as artillery officer for Combat Command A and commander of the 67th Armored Field Artillery Battalion.

Lieutenant Colonel Dale E. Means is Acting Director of the Department of Extension Courses, The Artillery School.

Major Raymond J. Wilson, Jr., an author and instructor in the Department of Extension Courses, has written two subcourses during his tour of duty with the Department.

Master Sergeant R. L. Dineley served as a battery officer with the 161st AAA Gun Battalion and the 209th AAA AW Battalion (SP) in the Pacific during the war. He is presently assigned to the ROTC Instructor Group at the University of California.

Captain Harold Broudy, CAC, graduated from the University of Pittsburgh and entered extended active duty in 1940. He was commissioned in the Regular Army in 1941 under the Thomason Act. He was a member of the AW Section of the AAA Board at Camp Davis, N. C. in 1944-1945 and served in the Occupation Army in Germany. He is presently serving as an instructor in the AW Section of the AAA & GM Branch, The Artillery School, at Fort Bliss, Texas.

Jerome Kearful is a New Yorker by birth, but has lived mostly in Texas, Massachusetts, and the District of Columbia. He attended University of Texas and Boston University. He worked for newspapers in Flint, Michigan, and Boston and was a writer for ASF Historical Branch, Chemical Corps, and U.S. Public Health Service during the war.

A PLAN FOR THE TRAINING OF UNASSIGNED RESERVISTS

By Lieutenant Colonel John M. King, GSC

The mission of the Organized Reserve Corps is to furnish in the event of emergency:

1. Units effectively organized, trained, and equipped in time of peace for rapid mobilization, expansion, and deployment.
2. Additional trained commissioned and enlisted personnel for the necessary replacement and expansion of the Army of the United States.

The recent modification of the ORC program reduced the number of troop basis units from 18,000 to 9,000 company size units. This figure is slightly less than the number of troop basis units presently activated. The desirable peacetime organization of these units is 100 per cent officer strength and 50 per cent enlisted strength. Under the former program many units were activated with an authorized strength of 100 per cent officers only, or a strength of 100 per cent officers plus a cadre. As part of the modified program, it was determined that in addition to the personnel required by these units, there must be available on M-Day some 330,000 individual officers and enlisted personnel. This group of individuals will constitute the Volunteer Reserve.

This Volunteer Reserve initially will include currently organized training units. Army commanders are presently authorized to organize practically any number and any type of training unit as a vehicle for training personnel of like branches or interests. The Army has given quite a bit of thought to the training of such a group of individuals. The training unit was not quite the answer to this training problem; therefore, the Army has developed and is in the process of implementing a plan for the training of individual reservists not assigned to troop basis units, known as the ORC School Plan.

At the present time the large majority of all ORC personnel remaining unassigned to troop basis units, after all such units have been activated and fully organized, will be officers. Therefore, the training of individual officers is the immediate problem. However, courses of instruction will be made available to enlisted personnel within this program where sufficient enlisted reservists desire to participate. Plans for the training of individual enlisted men and women are now under study.

The objective of the ORC School plan is threefold: (1) To provide training assignments for many Reserve officers for whom no T/O&E or T/D unit position vacancies now exist; (2) to offer, to the individual Reservist, progressive training, thereby affording him an opportunity to earn credit for retention in the Active Reserve, retirement, such reserve duty and active duty training pay as may become available, and credit for promotion; (3) to provide trained personnel for the replacement and expansion of the Army of the United States.

ORC schools will be established in each Army area, dependent upon the distribution of reserve personnel and the location of troop basis units. A school will operate much the same as a university. A separate department will be established within the school for Command and General Staff instruction and for each Branch of the service in which there is a minimum of ten active reservists to participate. The course of instruction offered to officers will be the same instruction provided in the associate courses at the service schools. The schools will be operated by the reservists. The staff and faculty of the schools will be organized under a Table of Distribution for an ORC school. The members of the school T/D will be Reserve officers and enlisted personnel in numbers necessary for the organization, administration, training, and supply of the school. Army commanders will appoint the best qualified Reserve officers within the area as ORC school commandant and directors of the various departments within the school. The commandant and the directors of the various departments will be furnished with Reserve assistants to perform the administrative duties of the school. Class instructors will be appointed from among the enrolled reservists. It is anticipated that reservist instructors at the school assemblies, normally will be officers who have satisfactorily completed the Resident Associate Course at the service school. Instructional material for use in the school will be prepared by the service schools and taken from the associate course of the schools. Instructional material will be modified to the extent necessary for presentation by reservists. A school will be located to provide evening classes for personnel residing within commuting distance of the school.

Programs of instruction, as well as instructional material in use at the service schools, will be adapted to a three-year Reserve program. The academic portion of the instruction will be accomplished during twenty-four 2-hour training assemblies in the evenings and the practical work will be accomplished during a fifteen-day field training period each year. One Regular Army officer (RA or EAD) unit instructor will supervise the activities of each ORC school. Regular Army officers and enlisted assistants to the ORC school supervisor will be assigned in accordance with the number of students.

In view of the great variation in training level and experience to be expected among ORC personnel to be trained, it is believed that the commandant of the school will

be best qualified to determine the different levels of courses which will be required in each school. The directors of each branch department will evaluate the various levels of courses of instruction which will be required for the reservists attached to his department.

It is not contemplated that a system can be set up whereby every individual can be afforded exactly the instruction he needs, though this is kept in mind as the ideal.

A pilot model ORC school was established in Allentown, Pa., in January, 1950, under the direction of the Chief, Army Field Forces. The Army plans to start the implementation of the ORC School Plan in each Army area before the end of the year, based on the experiences at the Allentown school.

It is planned that the members of the staff and faculty of the ORC schools will be eligible to earn 48 pay drills per year. The reservists attending the courses of instruction will be members of the Volunteer Reserve and as such will not be eligible to earn reserve duty training pay. Active duty training pay will be made available to members of the Volunteer Reserve participating in the school program.

It is recognized that due to the great dispersion of ORC personnel, and to the practical limitations on the number of ORC Schools that can be established, this system of training cannot provide reserve duty training for all members of the Organized Reserve Corps. Some personnel will have to make their own way by pursuing Army Extension Courses, taking advantage of active duty training tours, and such other activities as may become available.

The Army feels that the ORC School Plan will provide the necessary additional trained personnel for the replacement and expansion of the Army of the United States.

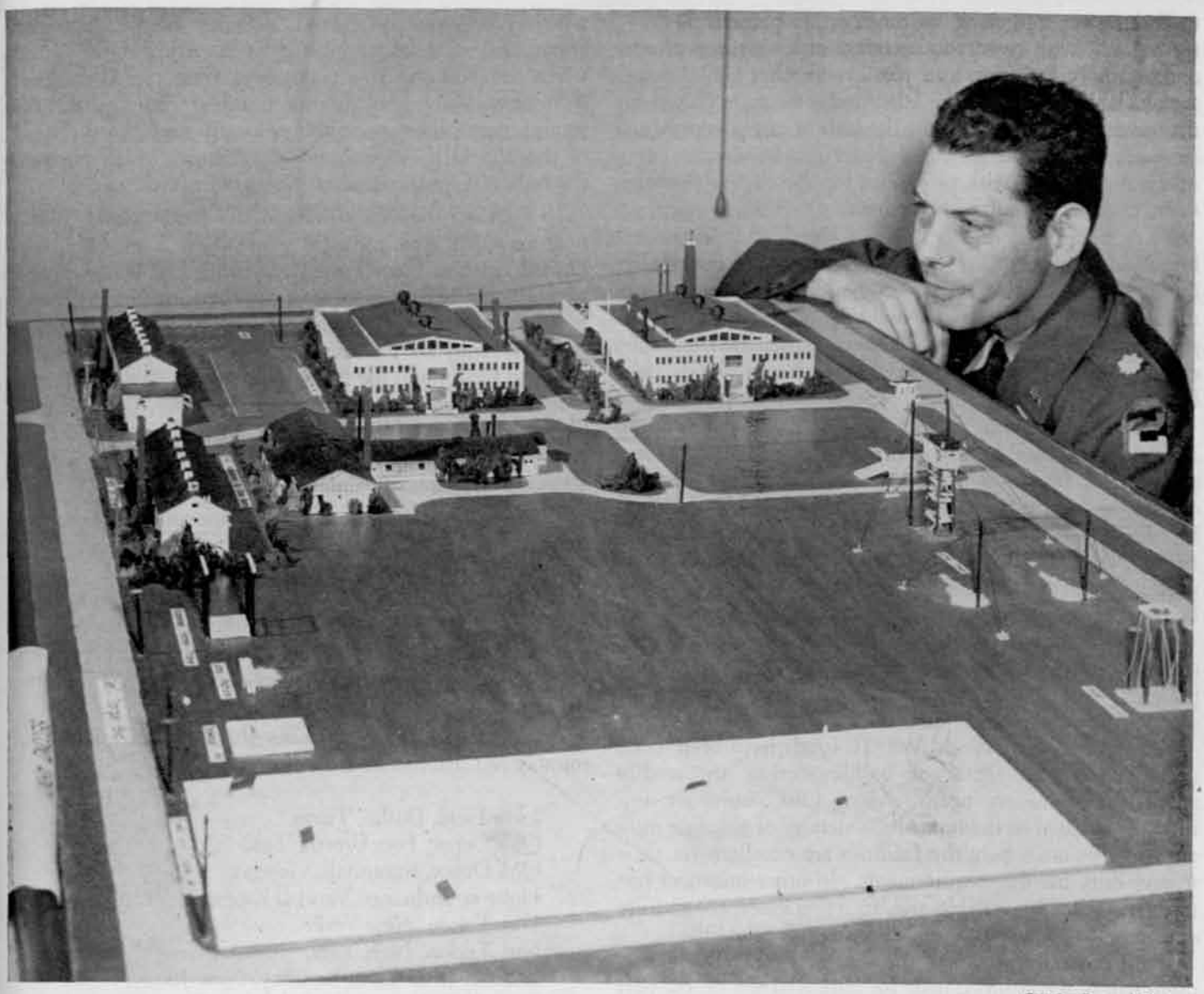
"The Fast Submarine"

By Ian Bremmer, British Navy

The greatest need at present is for a force of fast antisubmarine vessels, and the two destroyers which the Admiralty are converting into fast frigates are to be the prototypes of a larger conversion program. Three antisubmarine vessels of a new type are also to be built in Canada, and it is hoped to include a new antisubmarine vessel in the 1949-1950 naval budget. It would be far more satisfactory if a force of antisubmarine vessels could be built up without depleting our reserves of destroyers, but if a choice has to be made there is no doubt that it is fast frigates that we need most.

Even with fast vessels such as these, tactics will probably have to be revised. The feature of the fast submarine that offers most hope to the attacking forces is its short endurance. The Mark XXI can maintain 15 knots for an hour. The hydrogen-peroxide submarines of the future will probably have greater range and speed, but it is likely that a fast surface vessel will always be able to wear down the submarine, if only it can remain in contact with it. This is a much easier problem than attacking it while at speed. The submarine will then be forced in time to slow down, and the problem becomes one with which the Navy is already familiar.

The announcements of the development of a new antisubmarine weapon and the designing of a new antisubmarine vessel show that the Admiralty is tackling the problem. No announcement has been made about any alterations to the Asdic apparatus used to detect submarines, wartime models of which could only be operated at speeds of up to about 18 knots with any efficiency. The existence of Asdic was one of the Navy's best-kept secrets in the years between the wars, and any future developments are likely to be just as closely guarded. The absence of any news should not be taken to mean that nothing is being done. While it may be true to say that the answer to the 20-knot submarine has not yet been produced, the submarine itself is equally a thing of the future. On both sides, work is undoubtedly going ahead, and as islanders, dependent on shipping for the necessities of life, the British must hope that in the race between the two, the antisubmarine developments will establish a decisive lead.—Extracted from the *Military Review*, March 1950.



Courier-Journal Photo

Proposed Organized Reserve Training Center now partially complete where the 100th Airborne Division ORC uses parachute tower for jump training. Lt. Col. O. R. Durham, assistant Senior Army Instructor inspects model plan.

ORGANIZED RESERVE CORPS TRAINING FACILITIES

With more than eight million square feet of floor space in use for training of the Organized Reserve Corps throughout the country and the prospect that thirty new armories will be constructed or purchased during 1950, the postwar "housing" problem has never been quite so close to a satisfactory solution according to Army officials in the Office of the Executive for Reserve and ROTC Affairs.

Two years ago, when it was first planned to appropriate federal funds to furnish training quarters and storage facilities for ORC training purposes, the situation was extremely poor. No provisions existed to adequately meet the need for classrooms, to establish suitable space in which to store organizational equipment and to conduct the training of thousands of officers and enlisted members of the Organized Reserve.

In the early postwar years, Senior Army Instructors and their staffs were furnished with office facilities suitable for their own immediate needs but space in which to conduct unit training was arranged in any public or private building which happened to be temporarily available. Few indeed were the units fortunate enough to find permanent quarters, and the training program suffered in direct proportion to the uncertain and unsatisfactory arrangements that could be made on a catch-as-catch-can basis.

Today a ten-million dollar construction program is being carried out, with twenty-four communities assured of adequate armory facilities, and possibly another six, if funds are available. Much of the land that is being acquired for new armory sites is donated by the state or city governments. In some cases land is leased from private citizens at a nominal rental fee with provisions for the Federal Government to effect an outright purchase.

Plans have been drawn up for a standard type armory, housing from two to five units. Cost of one of the smaller buildings is estimated at $162,000 while a two-story structure, designed to house five military organizations, is expected to cost $325,000. Exterior construction may be either of concrete block or brick, whichever blends most harmoniously with the neighboring surroundings.

Still more ambitious plans are in the making if pending legislation is passed by Congress. This would provide for a grouping of buildings in designated areas throughout the country to form training centers which would be designed for the training needs of the civilian components of the Army, Navy and Air Force. Other National Defense Department functions in these areas, such as recruiting, would be centralized in these specially provided installations.

Unlike National Guard organizations whose armory facilities are provided by the various states, the reserve components have always been faced with the problem of securing adequate indoor quarters for training purposes.

Since the close of World War II, funds have been made available for the rental of buildings that are readily adaptable to military needs. Many ORC units are fortunately situated in the immediate vicinity of wartime military installations where the facilities are excellent for their reserve duty training requirements. In other instances factory floor space is available and, in a few cases, community enterprise has provided suitable buildings for the ORC.

Until federally provided armories are generally in use, there will be a continued need for improvisation on the part of reserve unit commanders and Senior Army Instructors on duty with the ORC.

In San Jose, California, and Fowler, Indiana, citizens committees have been formed. Prominent members of the community, including Reserve officers, have banded together to procure real estate for building sites. The Indiana community has completed an ideal armory, built by private capital and leased to the Government at an annual rental of $3600.

Rental costs to the Government for private properties now under lease vary with the standard rates in various sections of the country and with the general condition of the buildings rented. One dollar per square foot is a typical annual cost but in case of less desirable space, such as old factory buildings that will require an expenditure for repairs and adaptation, the square foot rate is considerably less. In crowded industrial communities, rates are correspondingly higher and suitable facilities more difficult to procure.

Among the larger centers of population, Atlanta, Georgia, has gone far toward reaching an ideal solution to the housing problem for the ORC. The 81st Infantry Division (ORC) and the 108th Airborne Division (ORC) have established headquarters in a splendidly equipped armory which was formerly a Ford assembly plant. Necessary alterations were accomplished with Army ORC funds when the building was taken over from the War Assets Administration. The Atlanta building contains 204,000 square feet of floor space and is ideally suited to the needs of the 183 ORC organizations and units which comprise the bulk of Georgia Reserve Corps personnel.

In Chicago the Navy Pier on the famous lake front is now an ORC training area, while New York City, with limited space at Forts Totten and Tilden, is badly in need of additional buildings to meet the needs of the large numbers of reservists in the Metropolitan area. Authorities of the First Army are planning the purchase of existing buildings and facilities in the New York area while Second Army is making similar arrangements in Reading, Pennsylvania. Other areas where space will be acquired by direct purchase are: Nashville, Tennessee, under the Third Army and in Kansas City, Kansas, in the Fifth Army area..

Reservists in two Louisiana cities are suitably situated in quarters owned by the Federal Government. Monroe ORC units have excellent facilities at Sellman Field where buildings formerly used in the production of the Norden bomb sight give them modern air conditioning. Shreveport organizations are making use of a wartime factory building. Built by the Government, the needs of the ORC were met by a minimum of conversion at slight cost.

Among the wartime localities that lend themselves admirably to ORC needs are:

Love Field, Dallas, Texas.
QM Depot, Fort Worth, Texas.
QM Depot, Savannah, Georgia.
Holston Ordnance Works, Kingsport, Tennessee.
Fort Totten, New York.
Fort Tilden, New York.
Kearney Ship Yard, Kearney, New Jersey.
Schuylkill Arsenal, Philadelphia, Pa.
Fort Missoula, Montana.
Rocky River Ordnance Works, Cleveland, Ohio.
Fort Wayne, Michigan.
Fort Preble, Maine.
QM Depot, Kansas City, Missouri.
Fort Des Moines, Iowa.
Fort Douglas, Utah.
Boise Barracks, Idaho.
Vancouver Barracks, Washington.

All of these and many more such installations are in use to a major extent by ORC units. In many instances the reservists have the exclusive use of these Government owned properties which hummed with activity during the war years. In another emergency they would again be available to the National Defense Program.

The Station Hospital at Fort Rosecrans, California, now provides facilities for San Diego reservists. Cells that were formerly used in the mental wards make excellent storage cubicles for organizational equipment.

In addition to the inactive posts, camps and stations where the ORC have established themselves, facilities are also in use at numerous army and air installations where

the Regular establishments are still operational. The list includes:

Drew Field, Tampa, Florida.
Coast Guard Depot, St. Petersburg, Florida.
Fort Sam Houston, Texas.
Presidio of San Francisco, California.
Fort Lawton, Washington.
Francis E. Warren Air Force Base, Wyoming.
QM Depot, Omaha, Nebraska.
Air Force Base, Jackson, Mississippi.
Fort Benjamin Harrison, Indiana.
Boston Army Base, Boston, Massachusetts.
Fort Snelling, Minnesota.

Roanoke, Virginia, has an armory which has been newly repaired and furnished with everything that could be desired. There is ample floor space for a glider for training of an airborne unit. Reading, Pennsylvania, and Greenwood, South Carolina, have excellent buildings which were built to ORC specifications by business interests. They can be adapted to civilian use should the need arise.

Despite the progress that has been made, many communities in widely scattered sections are not as fortunately situated. In addition to New York City, such cities as Gainesville and Charleston in South Carolina, Baton Rouge, Louisiana, Houston, Texas, Omaha, Nebraska, Grand Rapids, Michigan, Peoria, Illinois, Tulsa, Oklahoma, and Hartford, Connecticut, are in need of adequate armory facilities.

Construction of new armories will be supervised by Army Engineers and responsibility rests with Army commanders in the areas concerned. All properties, leased or purchased, are selected by Senior Army Instructors and the formal negotiations are carried out by personnel of the Engineer staff section in each Army who also inspect and pass upon the suitability of buildings under consideration for ORC purposes.

Much remains to be done before the problem has been completely solved. However, real progress has been made, and with the implementation of the new ORC training program, Army reservists can expect adequate facilities with which to conduct training that is realistic and designed to fit them for any National emergency.

There are two main paths open to every officer at the outset of his career. The choice is his alone, but if he find himself on the wrong path it is never too late to leave it and seek the right. The sooner he does this the better, for in the first few miles the routes are not far apart and the ground between is easily traveled. Later, the mountains of habit rise ever higher between them and the distance grows greater, so that the utmost fortitude is needed to attempt the crossing.

The perfect solution is to find this better path in the beginning and follow it to the end.—OFFICERS' CALL—No. 10.

Our Banner Still Waved

By Jerome Kearful

In many of its aspects, the War of 1812 was unique among the conflicts in which the United States has engaged. The direct cause of the war was removed four days after the proclamation of hostilities, and the only major land battle was fought two weeks after a treaty of peace had been signed. Yet no event of the war was more remarkable than the defense of Fort McHenry. Here an almost continuous twenty-four hours' bombardment was endured, yet a large British fleet was repulsed with scarcely the firing of one shot to the enemy's hundred!

After the invading British defeated a small American force with ridiculous ease at Bladensburg, Maryland, August 24, 1814, they entered Washington unopposed. After burning the Capitol and the President's Mansion, they turned their thoughts to Baltimore. Here was the home port of many of the American privateers who were wreaking such havoc on British shipping and causing acute embarrassment to the Royal Navy.

Thus British General Ross led his 5,000 troops, veterans of the arduous Napoleonic campaigns on the Continent, back aboard the fleet led by Admiral Sir Alexander Cochrane. General Ross and Admiral Cochrane planned a joint land-sea attack against vexatious Baltimore. Baltimoreans observing the approach of the British fleet through their spyglasses had never seen such a vast array of canvas as the British ships spread to the wind.

General Ross and his veterans were put ashore at North Point, within an easy day's march of the Maryland city. But Baltimore's defenders were not disposed to submit to any such inglorious defeat as the American troops at Bladensburg had suffered. When the first news of the British landings reached the city, several thousand regulars and state militia were speedily thrown in position to resist the invaders at a narrow neck of land halfway between the city and North Point. Here the Americans resisted stoutly, but the British, although General Ross was killed, eventually drove the defenders within the fortifications of Baltimore.

It was now the turn of the British navy to deliver its attack. The obstacle in their path was Fort McHenry, a solidly built work of masonry on the peninsula dividing the two branches of the Patapsco River.

Fort McHenry was manned by some 1,000 men, regulars and volunteers, under the command of Lieutenant Colonel George Armistead, an officer of the regular army. The defense batteries mounted a number of 32-pounders. The spirit of the American defenders was high, and their sense of responsibility keenly felt. As Colonel Armistead walked among his men and talked quietly with them, they were ready and waiting!

On August 13, the British fleet sailed up the Patapsco to begin the bombardment. From soundings already taken, the British knew that their largest ships would be forced to forego the action, since they could not approach within range because of the shallow water. Consequently, the attack began with five bomb vessels. As they came within the two-mile limit, they commenced firing.

Within Fort McHenry, the gunners, firing at the maximum range, offered spirited reply. As the British ships continued their bombardment, they began to score a few hits on the fort.

It was soon apparent to the American commander that the fire from Fort McHenry, even at its maximum possible range was consistently falling short of the floating targets. And the British consistently declined to approach closer to the fort. With the greatest reluctance, Colonel Armistead gave the order to his men to cease firing. The defenders would be obliged to endure the bombardment.

Although about one in four of the bombs and shells that the British were throwing against Fort McHenry was finding its mark, the defenders noted with a feeling of encouragement that they were doing little damage to the stoutly built fortfication. Shortly, however, a British shell scored a direct hit on a large gun and its crew, killing all members of the crew and destroying the gun. Soon after, a bomb landed directly on the fort's magazine. Irretrievable disaster, the likely sequel to such a lucky British hit, was avoided when the American luck was even better and the bomb did not explode!

Perceiving no returning fire from the fort, the British believed the batteries to be silenced. A smaller vessel approached nearer to investigate. The American guns soon sent it scurrying far out of range. As the day of the 13th ended, the situation remained unchanged; the British fleet dared not venture within the range of Fort McHenry's guns, while the Americans withheld their fire.

After night fell, the British continued their steady bombardment. But not once again did they score anything like their two hits of gun and magazine. As night wore on, the attackers decided on a fantastic plan of taking the fort from the rear, with scaling ladders.

For this purpose, a large force of British, bearing ladders, was sent shoreward in small boats. They made good their approach to land undetected, since there was no moon. But, in the same darkness, they were unable to see to make a landing, and sent up a flare. This rashness immediately drew the attention of the Americans, who sent a devastating fire against the landing party. Few ever returned to their boats.

As dawn of September 14, 1814, broke, "our banner still waved" over Fort McHenry! At seven o'clock in the morning, the British ships ceased firing and the entire expedition against Baltimore withdrew.

Answers To Questions On

TEST YOURSELF ON RADAR

From Page 15

ANSWERS

1. a	41. c
2. b	42. b
3. c	43. c
4. b	44. b
5. b	*45. d
6. See figure 2	46. a
7. b	47. a
8. S—10 cm, X-3cm.	48. a
9. a	49. c
10. b	50. b
11. c	51. a
12. d	52. d
13. d	53. c
14. c	54. c
15. b	55. d
16. c	56. c
17. a	*57. c
18. b	*58. c
19. d	*59. c
*20. a	60. a
21. b	61. c
22. a	62. a
23. a	63. b
24. b	64. a
25. c	65. a
*26. b	*66. a
*27. c	*67. c
28. d	68. c
29. b	69. b
30. a	70. b
31. b	71. b
32. c	72. d
33. d	73. c
*34. c	74. c
35. b	75. a
36. b	Ratings all questions:
37. c	35-45—FAIR
38. a	46-55—GOOD
39. c	56-65—EXCELLENT
40. b	Over 65—SUPERIOR

If * were omitted subtract 10 from above to find your rating.

1. The U. S. Navy is given credit for coining the word RADAR from the initial letters of *RA*dio *D*etection *A*nd *R*anging.

Fig. 1

2. Figure 1 shows an interior view of the best wartime ground force radar set, the SCR-584.

3. The type of scope shown is the PPI, the most common type of indicator in use today.

4. The J-scope gives a plot of range only. It differs from the A-scope only in that the J-scope has a circular base. This allows a longer scale on a tube of fixed size.

5. The tracking scope on the AN/MPG-1 is a B-scope as is the spotting scope. It gives range and azimuth in rectangular coordinates.

6. See Figure 2. The Timer is sometimes called the Modulation Generator.

7. The reason for the name Plan Position Indicator for the PPI scope is evident from the fact that the scope gives the plan view of the area as would be seen from a balloon over the area.

8. The S- and X-Bands are the two most widely encountered at the present time in combat arms radars. The five major bands are shown below:

Band Designation	*Frequency Limits in mc.*
P	225-390
L	390-1550
S	1550-5200
X	5200-11000
K	11000-33000

The mc. abbreviation used, means mega-cycles or millions of cycles per second. These bands are also frequently

referred to by their mid-frequency range wave length, *i.e.*, S-band is the 10 cm. band. The wave length is computed from the formula $\lambda = \frac{300}{f}$ where λ is the wave length in meters, f is the frequency in mc. and the constant 300 is the velocity of light in meters per millionth of a second (microsecond).

9. Radar Counter Measures, RCM, generally fall into two classes. The type which causes false echoes to appear through the dropping of reflecting material from a lead aeroplane is called "Mechanical Jamming." Although this was one of the most successful in the past war it is not expected to be nearly as effective in the future due to the invention of the MTI, Moving Target Indicator, which allows only those targets that move to show on the screen. Since the tinfoil is falling at the rate of only eight miles per hour when compared to the plane which dropped it, the tinfoil is a fixed object. See article "Radar Counter Measures," *Coast Artillery Journal*, September-October, 1946.

10. The second class of RCM is "Electronic Jamming." It still remains as a bugaboo with no cure-all in sight.

11. The tinfoil dropped in mechanical jamming had many forms and names. In addition to the name of "Window" it was also called flak-paper, chaff, and angel's hair. One of the most common forms was in strips cut to one-half the wave length of the radar to be jammed.

12. As everyone in the AAA knows, finding targets is not enough. They must be identified. The wartime attempt to do this electronically was IFF, Identification of Friend or Foe. (*Coast Artillery Journal*, September-October, 1946.)

13. The story of IFF is full of mistakes and failures. The result of a world-wide survey on all battlefronts showed that the failure lay not with the equipment in the great majority of cases but with the pilots who neglected to turn it on while over friendly territory.

14. The PPI scope gives two elements of information, range and azimuth, and presents them in a polar form.

15. Radars which are used for both search and fire-control have to compromise in the width of the beam used since a narrow beam is desired for maximum azimuth accuracy. The SCR-545 attempted to solve this problem by using two separate frequencies with two separate beams for the two jobs.

16. The set shown is the AN/TPL-1, much smaller and more maneuverable than its predecessor, the SCR-268.

17. Modern radar sets usually have only one antenna which both transmits the radio-frequency energy and receives the echo.

18. Radar accomplishes its mission of locating objects by transmission of radio energy and the reception of reflected energy.

19. Radio-frequency energy travels through the air at a velocity which is a constant for all practical purposes and is equal to the speed of light, 186,000 miles per second.

20. Since r-f energy travels at the rate of light, then it can go a loopmile in $\frac{2}{186{,}000} = .0000107$ seconds.

21. The narrower the beam the greater the potential azimuth and elevation accuracy.

22. The tendency to go higher and higher in radar frequencies, is because antenna systems can be made more directional and yet have a smaller physical size.

23. When a single antenna is used to transmit and receive as in modern radar sets, a T-R (transmit-receive) box is necessary to cut off the receiver when transmission is being made and to silence the transmitter when echoes are being received.

24. The indicator is a unit which presents a visual display of target echoes. This may be done in over twenty different ways. The most common having already been mentioned.

25. The most commonly used type of indicator instrument is a cathode ray tube similar to that used in television sets. In an old seacoast set (SCR-296) a direct reading meter was also used but this proved not too successful.

26. An echo that returns in 200 microseconds indicates a target range of 32,800 yards. (186,000 miles per second is equal to a travel of 82 yards per microsecond. Allowing for time out and back, it gives 32,800.)

27. It takes 12 microseconds for an echo to return from a target 200 yards away. $\frac{2000}{2x82} = 12.2$. Fortunately the user of radar need not perform these calculations since dials are calibrated in terms of yards or miles and not in units of time.

28. A microsecond is one-millionth of a second. This is a commonly used unit in all electronics work.

29. In radar, range is determined by measuring the time for the r-f energy to go to the target and return.

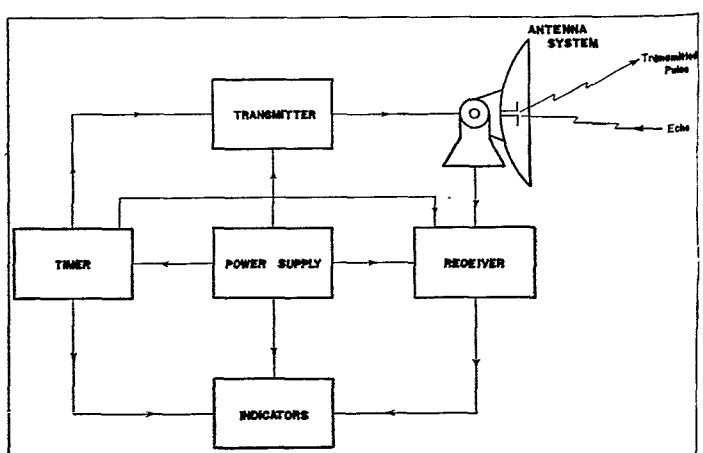
30. Azimuth is determined by concentrating the energy in a very narrow beam and noting the direction in which the antenna is pointed.

31. The six basic components of a radar set are transmitter, power supply, receiver, timer, antenna, and indicator. There may be more than one indicator and antenna. The timer is also known as the synchronizer or modulation generator.

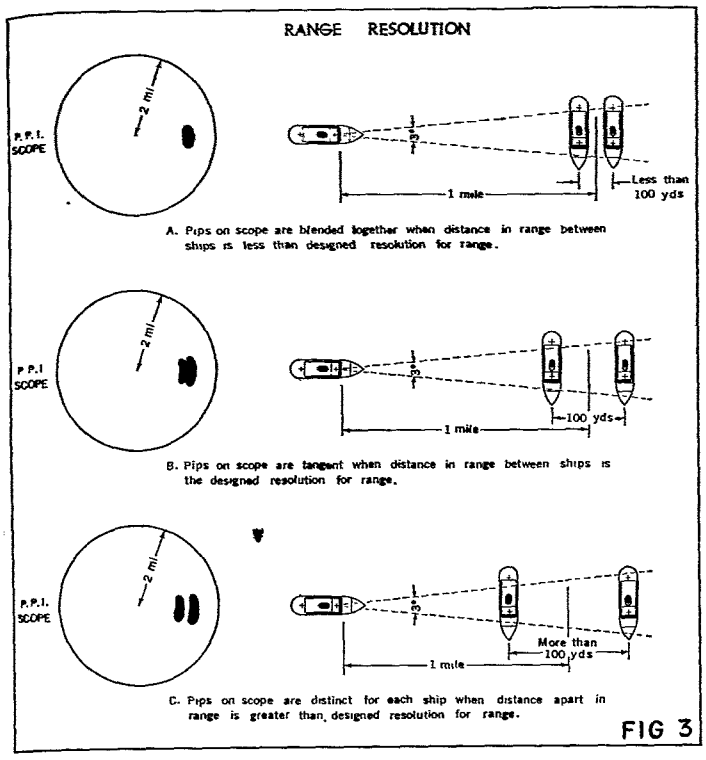
32. The "clock" used for the measurement of the small time intervals employed, is the modulation generator as its other name "timer" implies.

33. Radar uses frequencies from 225 mc. to 33000 mc. (see band designations, question 8) which puts it between commercial broadcasting and X-ray equipment.

34. A radar set that transmits a pulse of 5 microseconds



RADAR BLOCK DIAGRAM FIG 2



will start its useful range at (approx.) 820 yds. (5x164 yds. = 820 yds.)

35. Increased ranges are sometimes caused by refraction due to atmospheric conditions. (Trapping)

36. The minimum range at which a target may be detected is dependent largely upon pulse width as was emphasized by the numerical example of question 34.

37. It is generally assumed that refraction has the effect of increasing the distance to the apparent horizon for radar by 15%. This enables one to approximate the maximum range of a radar.

38. Nearby targets may not be detectable on a radar set because their echoes are masked by the main pulse.

39. Trapping, guided propagation, or anomalous propagation may be defined as a pronounced bending of the radar beam toward the surface of the earth. For a fuller discussion of this phenomenon see Radar and Weather, *Coast Artillery Journal*, March-April, 1947.

40. The net effect of trapping is to increase range.

41. Fog may act to decrease the maximum range.

42. Icing conditions may decrease the maximum range.

43. Radar range accuracy may vary if supply voltage fluctuates. Most sets have variable voltage transformers which enable a small amount of fluctuation of voltage without any effect on accuracy. This was not true with earlier sets.

44. Range resolution may be defined as the ability of a set to separate two echoes which are at the same bearing and closely spaced in range. See figure 3.

45. Beam width does not affect range resolution. Pulse length, size of scope in use and setting of receiver gain, all play a part. It is to be noted that the operator has control over the last-mentioned, receiver gain.

46. Azimuth resolution may be defined as the ability of a set to separate two echoes which are at the same range and closely spaced in azimuth.

47. The set with the smaller pulse duration will give the better range resolution. In this case ¼ microsecond.

48. The set with the narrowest beam will give the better azimuth resolution. In this case ½ degree.

49. The term "marker pips" as applied to PPI scopes refers to range calibration markers along the sweep length. Sometimes they are also used on other type scopes such as A-type.

50. The pulse repetition frequency is limited beecause the maximum range would be reduced. Time must be allowed for a pulse to go to the maximum range desired and return before the next one is sent out, or confusion would result.

51. Optical azimuths are more accurate than radar azimuths. Radar beams have finite widths narrow though they may be.

52. "Snow" on PPI scopes is caused by internal causes within the set and cannot be entirely eliminated. It is dangerous to turn the gain down so that no "snow" appears for the sensitivity of the set is reduced and may miss targets.

53. The purpose of the viewing hood is to shield the fluorescent screen from stray light.

54. Pipology is the term given to the art of interpretation of all types of contacts. See article of that title, *Coast Artillery Journal*, July-August, 1946.

55. Size, shape and movement of a pip are all aids to the experienced operator in pip interpretation.

56. The speed of antenna rotation has no effect on the size of the pip. Size of target, range of the target and material of which the target is composed, all have a decided effect on the size of the pip.

57. Land contacts are usually readily identified because they do not move, they are at expected positions, fade less than other targets and cover a greater area on screen than other contacts, with the possible exception of cloud echoes.

58. A sharply rising cliff will give a better echo than a sandspit, mud flats and marshes, or coral atolls.

59. A submerged rock like a completely submerged submarine, will give no echo since radar waves penetrate water to a negligible degree.

60. Fog will not return an echo. Rain, clouds, and snow have all been commonly observed on scopes.

61. A minor lobe echo is an unwanted echo caused by echoes from energy which has leaked off in side and back lobes. It would be desirable to concentrate all energy into a single beam in the forward direction, but the present state of the electronic art precludes this.

62. Reflection echoes are caused by the bouncing of the echo off of an object near the antenna. Care in siting will eliminate this.

63. Second-trip echoes are caused by the return of an echo from pulse 1 after pulse 2 has gone out. It will appear at a false range.

64. A target which is behind another reflecting object such as a mountain, will not give an echo because it is in a radar shadow. Radar waves behave like light waves. Moral: Don't let planes sneak in on you from behind a land mask.

65. Blind sectors may exist on some azimuths because of improper location of the antenna. Don't forget the radar cannot see through objects.

66. Beam width distortion causes targets to appear wider.

67. Pulse duration distortion causes targets to appear longer in range.

68. So far as is publicly known, the Aurora Borealis has no effect whatsoever on radar operation.

69. Only experienced men should attempt to repair radar sets for, in addition to being a complex instrument, high voltages are used in radar and may cause death. Even experienced men should not work alone. It has been demonstrated to medical satisfaction that radar does not cause sterility or baldness.

70. Preventative maintenance can greatly cut down the number of equipment failures, since the life of tubes can be predicted and replacement made before they give out. At least 80% of equipment failures are due to tube failures.

71. Echo boxes find their chief use in tuning the receiver to the transmitter.

72. Echo boxes can indicate approximate transmitter output, can measure frequency, and provide a "phantom target." They do not trap undesired echoes.

73. Secondary radar is the term usually applied to aids to radar, *i.e.*, beacons, reflectors and the like. See article "Secondary Radar," ANTIAIRCRAFT JOURNAL, November-December, 1949.

74. A corner reflector is an object composed of two plane reflectors reflecting surfaces which are at right angles. When placed on a target they make the target pip visible from greater distances.

75. The gadget pictured is a Radar Prediction Device (RPD). See article ANTIAIRCRAFT JOURNAL, May-June, 1948.

We in America have grown accustomed to expect a great deal of our military leaders. First and foremost they must win wars. On that score, they have made a perfect record. If they had achieved nothing more than victory in battle they would have justified wholly our investment in their training and our faith in their ability.

But there is something more than victory in battle that we expect of you, military leaders. We expect leadership in the American tradition:—physical courage in the face of an enemy; moral courage in the face of criticism and adversity; devotion beyond call of duty; integrity above question; readiness and willingness to serve anywhere on any assignment, and a capacity to carry every job to a successful conclusion; and, finally, loyalty, not only to superior authority, but to those under your command in a spirit of *noblesse oblige*.

This is, indeed, a formidable array of demands that we make upon you, our military leaders; and what is most remarkable, is the fact that the demands are met, met practically every time. Here and there on a rare occasion, someone appears to deviate from the high moral code of conduct that we expect of our officers. The shock is always terrific. Because such lapses are rare, they are sensational and attract wide attention. The fact that they get the headlines is evidence in itself that they are exceptional. The core of our officers corps is healthy and sound. Our military leaders are worthy of the respect of the American people that they so largely enjoy.

LOUIS JOHNSON, Secretary of Defense.

General J. Lawton Collins Addresses Industry-Army Conference*

The strength potential of our Nation—and our determination to develop it, and to share it with our friends—has, in my opinion, prevented war for the past several years.

The far-reaching decisions—national and international—that we have made with our friends of the free world have achieved significant progress in establishing the long-range security posture we need.

For we live in a tense atmosphere of armistice that fluctuates with the strength we maintain as opposed to the strength of those who cause the tension.

Unfortunately, the day has not yet come when we can relax with some sense of confidence that war has been eliminated from the world, but must instead apportion a part of our efforts to the preparation for a war which might be thrust upon us before we could attain lasting peace. Therefore, we must to a considerable degree predicate *our* plans upon the actions of the evil forces in the world which are seeking our downfall.

For while we have been working for lasting peace, and even permitting our military forces to be drastically demobilized, the police states of the world have been constantly increasing *their* military strength.

By subordinating all other considerations to those of a military nature, they have achieved a strength that makes their bid for power more menacing to world peace. For their bid is supported by forces in-being that greatly outnumber those of the free world. They have powerful land armies skilled in the use of modern weapons and backed up by tremendous reserves of trained military manpower and munitions sufficient for extensive operations.

It was for this reason that we have been compelled to rebuild our own strength, and to assist our friends to rebuild theirs. I believe that in both of these endeavors we have achieved significant success. For although our own military forces have not yet reached the effectiveness that we would like to have, and although our friends still have a long way to go in rebuilding *their* strength, I feel that our over-all security posture is steadily improving.

There is no doubt but that we could build the greatest military strength in the world if we put our minds—and pocketbooks—to it. We have already proved our ability to do so by the miracles that we performed in the past war.

However, we do not wish—nor do we feel it wise—to seek security in the construction of a garrison state in which we "dance to the tune" of potential enemies in order to match them ship-for-ship, plane-for-plane, tank-for-tank, and division-for-division.

Arms-race security alone would be a fragile security at best—at worst it could presage economic disaster.

We must not permit ourselves to be stampeded into abandoning all of our long-range plans to prevent war. Instead we must maintain a balance, employing our resources wisely, and directing our efforts in such manner that neither by weakness do we invite military disaster, nor by inordinate military preparedness invite economic disaster.

Now as to the forces in-being we need to maintain, there are of course differences of opinion. We have advocates of air power, and of naval power, and of land power. We have advocates of large forces and of small forces. And each of these is supported by earnest men of honest conviction. Decisions have been made with regard to all of these questions, and we in the Army will support them to the limit of our capabilities.

The Army has been assigned a role in the defense plans of our Nation that requires it to be ready at all times to move to meet aggression by the fastest means and with the greatest fire power—and by its readiness to do this, to help prevent aggression from taking place. Of course, the Army role must be correlated with the roles of the other services, and must be implemented to the end that the maximum in security may be obtained within the necessary ceilings of a national defense budget.

I am happy to report that the Army is fulfilling all of these requirements; we have units that are ready to move right now in case of aggression; we have the best men in the Army today that we have ever had in peacetime and, although we have a number of critical equipment problems yet to solve, I can assure you that our troops, with the equipment that they have, would give a good account of themselves if we were attacked.

The recent reduction of our occupation commitments has enabled us to concentrate more of our efforts upon strengthening the combat units which form the hard core of our fighting force. We are giving our divisions and other combat units more officers and men, some items of better weapons and equipment, and improved training under field conditions.

Although the Army is now deployed to meet the requirements of our postwar responsibilities, it must also be prepared to assume immediately the new role that an emergency might dictate. For example, our forces in Europe must maintain a high state of readiness as a result of our decision to defend Western Europe rather than to retake it from an aggressor. Our troops in the Pacific must do likewise because of communist expansion in that area. I have personally inspected within the year our units in Europe and in the Far East and I was much impressed with their excellent morale and state of training.

The most important element of armies has always been men imbued with the will to win. And today the strength of nations is still measured by their ability to produce such men, although it depends more than ever before upon their

*Fourth National Industry-Army Conference, New Orleans, Louisiana, February 27, 1950.

ability simultaneously to provide the equipment with which men fight.

Democracy, more than any other system of government, has the ability to produce these two essential elements. For under democracy, all citizens have a vested interest in their freedoms which inspires the will to win. They also have a vested interest in our system of free enterprise which inspires the production of great peacetime abundance, and which, if we were threatened, could be converted to produce overwhelming quantities of the machines of war.

The extent to which we can develop our productive facilities was demonstrated during World War II. As great as was our war effort, at no time did it absorb more than two-fifths of our total national output. We produced all of the equipment and supplies that our own troops needed; we supplied vast quantities to our allies; and, at the same time, we provided the civilian economy with a greater total amount of goods and services than in such prewar years as 1937 and 1939.

During five years of defensive preparation and war—from 1940 to 1945—American industry produced munitions valued at more than 186 billion dollars. Included in this huge total were more than 86 thousand tanks, more than 300 thousand artillery pieces, more than 40 billion rounds of small-arms ammunition, nearly 300 thousand airplanes, and more than 70 thousand ships and vessels.

As a part of the Armed Forces of a free democracy, we in the Army have always felt that we were in some respects more fortunate than the Air Force and the Navy. Although we do not feel that we are something apart from them, we do feel that because the importance of the individual in the Army has always been of primary emphasis—just as it is in our democracy—the Army has a closer affinity to the very essence of our democratic way of life.

Because of the great emphasis upon men in the Army, however, there is a tendency to oversimplify our equipment problems, inspired perhaps by the almost complete dependence of the Navy and the Air Force upon great machines.

The modern soldier, like his counterparts in the Navy and Air Force, is more dependent than ever before upon the complex machines of modern war.

For the combat soldier of today no longer marches into battle—instead he enters the battlefield by truck, from planes, or aboard a tank. And when he performs his historic role of meeting the enemy face-to-face, he must have the tremendous mobility and fire power that modern war demands, and which intricate scientific and technical devices alone can provide. Within the infantry division, for example, he has at his disposal more than 20,000 weapons of all types, more than 2,000 radios, and more than 4,000 vehicles.

We have continued to get the most out of the equipment we have on hand not only by taking better care of it, but also by vigorously pursuing our overhaul and rebuild program, which I would like to explain in greater detail.

As you know, the hasty demobilization after World War II nearly destroyed our greatest Army, and was such that troops virtually had to walk off and leave their equipment. As a result, we found that we had vast quantities of it—some serviceable and some unserviceable—widely scattered, some on inaccessible islands, and much of it requiring repair.

We are collecting and concentrating this equipment in those areas where adequate supplies of labor are available.

In the Pacific, we are shipping the bulk to Japan, where we have approximately 60,000 general purpose Army and Air Force vehicles to rebuild. At the present time, we are processing them at the rate of 1,000 a month, and at a fraction of the cost of new procurement. In Europe, where there is an ample reservoir of skilled labor, the program got under way earlier, and we have rebuilt 220 million dollars worth of equipment including 38,000 vehicles. And in the United States, our overhaul and rebuild program has also gone forward as rapidly as funds would permit.

One of the most important factors contributing to the success of this program has been the waterproofing techniques that were developed by industry for the Armed Forces during the war. It was amazing to me to find the contents of a box which had literally fallen apart still perfectly usable because of the careful preparation of the items within for overseas shipment.

The Army overhaul and rebuild program is permitting the more effective utilization of Army stocks, and is going a long way toward fulfilling our current needs in general purpose vehicles. However, stories concerning storage areas crammed with equipment may have created the impression that the number of such vehicles is limitless. Actually, we expect that the last of the usable general purpose vehicles will be repaired and put into service within approximately three years.

But we cannot hope to meet our full requirements from stockpiles of existing equipment which grows progressively obsolete. For as the capabilities of potential enemies grow with the development of new weapons, we must provide means of countering them.

The Army's research and development program is designed to meet these requirements. It is an expensive process but the results obtained in the past war testify eloquently to the soundness of the investment. During World War II, the equipment of American soldiers was, in general, better than that of any other nation in the world. We found this policy to be a good one, for it saved many lives.

In our approach to this problem we have abandoned our former relationship with industry under which the Army set forth detailed specifications for the development of desired items which we relied upon industry to meet. As a result of our experience, we established objectives rather than detailed specifications. Thus we have entered into a partnership which permits us to keep industry constantly aware of our changing requirements and thereby to draw in the most efficient manner upon the accumulated technical know-how and ingenuity of our civilian partners in the development of military equipment.

We in the Army are cooperating with industry in the simplification and standardization of common items. For we recognize that in spite of our tremendous resources and productive capability, we can hope to meet the ravenous demands of war only by reducing the number of types and sizes of weapons and equipment and by simplifying their design and manufacture.

The Army is directing its efforts in this field in two principal directions. First, we are conducting a continuing review of our needs in order to minimize our requirements. Second, we are integrating our research and development activities and we have achieved an encouraging degree of standardization in military items. I am confident that these and related activities will simplify the task of fulfilling the heavy demands which we must place upon industry.

Of course, we cannot afford to place the same emphasis upon peacetime military production as can the police states —we must depend instead upon producing superior equipment in limited quantities that can be mass-produced in time of emergency.

This is true, for example, in the field of tanks where our need for modern equipment is most critical. At the present time, the police states have amassed a total of more than 40,000 medium and heavy tanks of all types. In contrast to this, we have approximately 6,000 combat-worthy tanks of light and medium varieties and, except for prototypes, we have not purchased a single new tank since the end of the war.

We have, however, undertaken a long-range tank program based upon an exhaustive analysis of our own tanks and those of other nations. Under our Balanced Tank Program, we propose the development and limited production of a family of tanks superior to those of any possible future enemy, and the establishment of modest production facilities capable of rapid expansion in the event of an emergency.

We now have what we believe is the best light tank in the world and we are now awaiting delivery of a sufficient quantity to equip our divisions and smaller units with these fine new weapons. We also have the prototype of a new medium tank which we plan to bring into limited production at an early date. And to round out our concept of a family of tanks, we have designs for a heavy tank. However, we are not going to build any heavy tanks until we are sure that we cannot knock out the heaviest of heavies with the improved guns and ammunition of our new light and medium tanks. We are not going to spend money on heavy tanks simply because the "other fellow" has them.

In the vital field of antiaircraft, the advent of jet aircraft has required radical departures from World War II equipment. The continuing development of planes which attain ever-increasing speeds has further emphasized our need for new counterweapons of all types.

Our best answer to date for the threat posed by aircraft at short and medium ranges is the new 75mm "Skysweeper" gun. This weapon has been developed to replace the present standard 40mm AAA gun of World War II fame which does not have sufficiently sensitive fire control, sufficient range, or sufficient destructive effect to engage modern aircraft.

The primary new features of the Skysweeper are its integral radar-directed fire control system and its VT-fuzed ammunition. Tests to date indicate that this weapon is capable of engaging aircraft at supersonic speeds, both by day and night. We have orders for a limited number of these very fine weapons now, and expect to buy more of them during each succeeding year.

And for detecting and engaging high altitude aircraft traveling at near-sonic speeds, we are this year buying a number of extremely accurate fire control systems for use with our long-range antiaircraft guns.

It is becoming increasingly clear, however, that we are approaching practical limits in the development of *conventional* antiaircraft weapons and that we must look for more promising means of meeting our foreseeable requirements. For that reason, we are placing renewed emphasis upon antiaircraft rockets and guided missiles.

We are endeavoring to provide a series of new weapons which will increase our capabilities against both aerial and ground targets. Within our program, which is correlated with the Armed Forces Guided Missiles Program, we are devoting the maximum effort possible to these promising new weapons. Only last week I visited our Antiaircraft Center at Fort Bliss, Texas, and our Guided Missile proving ground at White Sands, New Mexico, and I can assure you that genuine progress is being made. We have under development an antiaircraft rocket which we believe will effectively combat high speed aircraft at altitudes and ranges which lie beyond the capabilities of antiaircraft guns, and an antiaircraft guided missile, which gives promise of providing the even greater accuracy and lethality we seek.

Another field in which we are tremendously interested is airborne operations. I had the privilege of commanding two of our great airborne divisions in the initial landing in Normandy and they did vital fighting in the quick seizure of our bridgehead and in cutting off the port of Cherbourg.

We conducted a number of successful airborne and air-ground support operations during the last war, and have made some progress since that time in improving the methods of committing men and equipment to combat from the air. However, we have really just begun to master the art of airborne warfare, as contrasted with amphibious operations in which we have already demonstrated our competence. Of course, we must keep the amphibious art alive, but we are placing increasing emphasis upon airborne operations.

We are working very closely with the Air Force in a joint effort to solve our mutual problems. Among the specific improvements we have made is the prototype of an airplane that can carry a tank. This is a significant achievement, since our inability to deliver tanks by air was one of the greatest weaknesses of our airborne operations of World War II. This plane can carry 240 men, or 50,000 pounds of cargo.

We have also developed airplanes and equipment that have not only carried successfully the "Jeep" and the 105mm howitzer but have permitted their being dropped by parachute. And we have prototypes of gliders that can carry double the loads transported during World War II, and a new assault transport airplane that may actually replace the glider in airborne operations.

I must emphasize, however, that we are far from meeting our requirements. Our airborne troops must have more fire power, an airborne tank that some day we may be able to drop by parachute, and greater artillery support, including airborne antiaircraft weapons for our paratroopers after they hit the ground.

Our experience in the last war clearly indicated the vital necessity for tactical air support in the conduct of ground

operations. As a matter of fact, tactical air support really is the "artillery" of airborne operations.

In any land operation, the artillery capabilities of modern tactical aircraft extend and strengthen the fires of ground weapons and are extremely effective against tanks and other armored vehicles. In all our training, we are stressing air-ground coordination in order that we may be prepared to make the most effective use of tactical air support in future operations.

The success of our ground operations in any future war will depend more than ever before upon the degree of air support that is provided. Given air transports in sufficient quantity, our infantry divisions can assume greater strategic importance in the far-flung operations of a global war. With the necessary gliders and other specialized equipment, our airborne divisions can go over the enemy's lines to strike vital targets which otherwise could be taken only at great loss in men and equipment. And with the increased fire power afforded by tactical air support to isolate the enemy and drive him to cover, our ground units can gain the freedom of movement quickly to overcome the enemy.

During the past war, excellent rapport was enjoyed between the Army and Industry. But without the urgency of war, we in the Army, and you in Industry, must guard against the tendency to become preoccupied with our own individual problems and to go our separate ways. Co-operative activities such as this Industry-Army Conference will contribute greatly toward continuing this rapport, and we in the military are extremely grateful for the opportunity to participate in the program.

For we have learned that without industrial preparedness, military forces alone are impotent. We are convinced that if war should ever come again, our great productive capacity and the proven ingenuity of our men of industry would assure us the means we would need to attain ultimate victory.

We in the military are fully aware that preparedness planning with its attendant advantages would be impossible without the active and enthusiastic cooperation of private industry. And we are deeply appreciative of the substantial contributions which you have made to the security of our nation, often at considerable personal sacrifice.

This conference has represented the finest spirit of civilian-military partnership and in which we in the Army are proud to share. I am sure that the continuation of these conferences in this spirit will produce not only a more complete understanding of our needs in the event of war, but even more important, will contribute to the maintenance of the military posture we need to prevent war, which should always be our overriding purpose.

There is one aspect of this meeting that I feel that we can all be grateful for. Instead of being here as we would under police state regimes—by direction, and in the repressive atmosphere that pervades their every action—we come voluntarily, as patriotic citizens seeking to preserve the freedoms we enjoy, and which freedom-loving peoples everywhere are seeking.

We must insure that this will always be our privilege.

Model Gun Trainer Aids Guard

A classroom-size model 90mm gun outfit that saves many hours of labor in the handling of heavy equipment has been pioneered in New Mexico to streamline the training of National Guard antiaircraft units.

It's an easy-to-build device that should be a delight to model-making hobbyists, and a boon to instruction in cabling and de-cabling the various components of a gun battery.

The miniature setup is the brain child of Lt. Col. W. E. H. Voehl, Instructor for the 515th AAA Gp., and Brig. Gen. Harry M. Peck, former Exec of the 200th AAA Regt. and a survivor of the Bataan "Death March."

The radar computer trailer, tracker, and generating unit with trailer are on a scale of 1″ to 1′; the main junction box is 4″ square; the Signal Corps adapter, 3″ in diameter; the cloud switch, 2″ in diameter; the plugs, four sizes, the largest ¾″. The cables are made of cord, in four sizes, 1″ equaling 5′ in length.

Some modifications of construction details obviously are necessary in fashioning the miniatures. Female plugs are indicated by drill holes in the base of the receptacles, each hole equaling two conductors; the male ends are blanks. The same color scheme as used on actual equipment to indicate various connections, is followed on the models. Small typed labels are pasted on the equipment to identify the equipment and cable connections.

Demonstrations of the training aid with various units have shown that cabling can be taught to an individual in 10 minutes, the "inventors" report.—*The National Guardsmen.*

AAA AT THE BRIDGE

By Master Sergeant R. L. Dineley, CAC

Clearly demonstrating the inimitable versatility of the Coast Artillery Corps, this article is a challenge to our readers to "Top This One"—Let the JOURNAL publish your unusual solution in 1,000 words or less.—Ed.

There's a lot more to this business of ack-ack soldiering than just shooting the guns. For example, take the case of Lt. Colonel Harry O. Bailey's 161st Gun Battalion which built a 90-foot bridge over a mad New Guinea river, and that after the engineers had refused the job, maintaining that whatever they built would be washed away with the first heavy rains.

The bridge we built stood for the two rainy seasons we were there and for all I know it may still be standing!

We were sent up to Nadzab, New Guinea in January 1944. The mission was to furnish gun defense for a Fifth Air Force Bomber Base. The air strips ran alongside the crazy Erap River, a two-channel affair with a low rock shoal dividing the channels, each of which—during the dry season—was about forty feet wide and five feet deep.

It was of course SOP that we arrived without our guns. Perhaps that was a good thing as it was soon obvious that we would require access to the far bank of the river in order to locate two batteries there. The battalion went to work using only its organic means and vehicles: man power, hard work and imagination were to take the place of heavy equipment.

Every battery had a part. Battery A, under Captain Welford Sherman, worked on the bridge itself in accordance with plans prepared by Major Neil Wilcox, Battalion S-3. Batteries C and D, under Captains Arthur Malacky and Samuel Spivey, worked on the roads and approaches. Captain Chester Purcell's Battery B were the lumberjacks who wrested giant timbers from the virgin forest at the cost of many cases of jungle rot and one death—Private John Britt.

But in those two months before the guns arrived, "Britt Bridge," as it was named, went up. First a fifty-foot log was floated into position across the near channel, raised about a foot above the water and anchored on the shore and the midstream shoal. It provided a precarious footpath for our daily labors. Many a laugh was provided but many a shovel was lost by a fall from the slippery log in midstream.

While one crew dug the abutments others balanced their way to the shoal and hand-carried rock from the downstream to the upstream point. Another crew gathered rocks on shore, dumping them into the water above the log. Even the wrecker was used to move boulders into the madly rushing waters. It was found that by heavy acceleration on the throttle and with the fan belt disconnected, our 2½'s were able to back into the current and slowly buck their way to the shoal with additional loads of rock. Occasionally one had to be towed out and the muddy water played havoc with the wheel bearings and the brake lining. The battalion maintenance section worked 24 hours a day during the whole course of construction.

Eventually the gap between shore and shoal was closed and sandbagged. A pump, borrowed from the engineers, kept the water at a minimum as the men dug and blasted their way down to solid rock in order to provide a footing for the framework.

Some of the men, originally from the lumber camps of Oregon and Washington, provided the skill with axe and saw to make the frames which were cut, assembled, and numbered on shore. Each frame was six-sided and was about ten feet high. When the footing for each was ready they were disassembled and rushed into the waiting holes in the new semi-dry channel. They were constructed of keyed logs each 12 inches in diameter and spiked together with reinforcing rod. When they were in place, aligned, and leveled, they were packed solid with large rocks, each emplaced by hand so as to give the most solid support.

With the two abutments handled in the same fashion and each of the three frames in place, the spans, 16 inches square, were laid and the deck was applied.

Half the battle was over. The dam was breached and the stream diverted to the other channel where the process was repeated.

Almost simultaneously the guns and equipment arrived and two batteries crossed to take up position. Although at times during the rainy season the water was up to the spans, not a timber gave way.

American ingenuity and Coast Artillery Corps versatility had again been demonstrated.

Third Army Civilian Component Training

One of the most progressive steps in troop training during World War II was the establishment of instruction teams which were organized for the purpose of assisting with the training of units in the Theaters of Operations.

This system, which produced such splendid results in the wartime Army, is being operated in the Third Army area where specially prepared instructors follow a prearranged itinerary in the military districts of Alabama, Tennessee, Florida, Georgia, North Carolina, South Carolina and Mississippi.

Inasmuch as the attendance at the presentations is on a voluntary, nonpay basis, it was necessary to select subjects initially which would be of interest and informative to all branches of the civilian components. The response to the presentations has been very good, and the civilian components personnel have been well pleased with the instruction given.

Various ways and means have been taken by Third Army to augment and further the normal reserve duty or armory training of antiaircraft artillery civilian components personnel. Some examples of these are stated below.

Coordination has been effected with the Antiaircraft and Guided Missiles Branch of The Artillery School, Fort Bliss, Texas, for distribution of Book Department catalogs and other training material issued from that source. Within the availability of funds, military districts have been authorized to purchase instructional material suitable to the needs of AAA Organized Reserve Corps units.

To further the military education of antiaircraft artillery civilian components officers, wide dissemination is made of the various school courses available at the Antiaircraft and Guided Missiles Branch, The Artillery School. Twenty-one Reserve officers from Third Army Area attended the fifteen-day indoctrination courses conducted at that school in June and July, 1949.

Units are encouraged to participate in command post exercises and other week-end training. Every assistance is given to support this type training. The 431st AAA AW Battalion, ORC, Atlanta, Georgia, participated in a joint command post exercise 13-14 August 1949, with Naval Reserve and Marine Reserve air units. This exercise was very successful and clearly demonstrated that effective joint training can be conducted by and for the civilian components.

Headquarters Third Army is conducting a controlled map maneuver, "Exercise Dixie," at Fort McPherson, Georgia, 22-23 April 1950, for all National Guard and Organized Reserve Corps major command headquarters, in which the 108th AAA Brigade Headquarters Georgia National Guard, will take part.

Army Field Forces has indicated that current plans envision furnishing an instructional team composed of five AAA officers to the Third Army Area to aid in civilian components antiaircraft training. Provided this team is made available prior to 30 April 1950, Third Army will establish two-week schools for civilian components AAA officers to be conducted prior to the summer training period. In addition the team will be used to assist in the summer field training of National Guard and Organized Reserve Corps AAA units at Camp Stewart, Georgia, this summer. This will be over and above the normal AAA instruction teams, which consist of three officers and eight enlisted men, being made available by the Chief, Army Field Forces, for civilian components AAA instruction during field training. Long-range plans contemplate conduct of two-week schools for officers and key enlisted men of civilian components antiaircraft units next winter and next spring. The aforementioned five-man team will be used to present instruction at these schools.

Coordination is being effected whereby nine ORC antiaircraft units will train with the National Guard antiaircraft units at the field training encampment at Camp Stewart, Georgia, during the period 2 July-20 July 1950. This will insure that the best possible facilities for training of AAA personnel are made available to all.

Third Armored Reunion

Members of the Third Armored Division Association will meet in Chicago on July 6-7-8 at the Congress Hotel.

Industry-Army Conference at New Orleans

By Colonel Donald E. MacDonald, CAC (Res.)*

The Fourth National Industry-Army Conference was held in New Orleans on February 27, 1950 with approximately 750 in attendance. The three featured speakers at the "off the record" session were: Lt. General Matthew B. Ridgeway, Lt. General Edward H. Brooks and Lt. General Alfred M. Gruenther. In addition, Lt. General LeRoy Lutes, Commanding General, Fourth Army, Major General Floyd L. Parks, public information, Major General Frank A. Heileman, Chief of Transportation, Major General Lewis A. Pick, Chief of Engineers, and Major General Herman Feldman, Quartermaster General, were present.

The Chief of Staff, General J. Lawton Collins, arrived later in the day and was the speaker of the evening at the banquet held in the Gold Room of the Roosevelt Hotel. (General Collin's address is reported in full on page 49.)

The chiefs of the various branches were entertained at luncheons, given by the different branch associations, at which time the problems of the branches were discussed and new weapons and techniques explained.

At the "off the record" session held in the grand ballroom of the Roosevelt Hotel in the afternoon, Mr. Lester F. Alexander, a prominent engineer and ex-officio Chairman of the Conference, introduced the speakers. Lt. General Edward H. Brooks, Director of Personnel and Administration, Department of the Army, was the first speaker. The keynote of his talk was economy. He stated that economy in personnel was essential. He pointed out that in World War II, the United States put eighty-nine divisions into the theaters of operation and that by the end of the war, every infantry division had been committed and that none was in training either in the United States or in the theaters of operation. He stressed the importance of maintaining in force the Selective Service Act, so that in the event of another major emergency, it could become operative at once rather than to have it or a similar law reenacted with an attendant delay of from four to six months before it could become operative. He stated that in peacetime it was not intended to use the Selective Service Act, but it must be ready for use.

Lt. General Matthew B. Ridgeway, Deputy Chief of Staff, made an impressive speech in which he pointed out that it is destructive to the morale of troops to know or think that their arms are inferior to those of the enemy and that in the present state of relations between the various governments, the United States must rely on superior weapons in the face of our potential enemy's numerical superiority in manpower. Deciding factors in any future war are morale and competent leadership.

Lt. General Alfred H. Gruenther, Deputy Chief of Staff for Plans, spoke on the military establishment of the Union of Soviet Socialist Republics, pointing out that a very large part of the Russian production is being devoted to military uses, and that they are engaged in stock-piling critical items.

After his talk, General Gruenther answered questions put to him from the audience. Most of the questions indicated serious thinking on all problems affecting U.S.-Soviet relations and General Gruenther gave answers that were satisfactory to his questioners.

Reviewing the afternoon session, it was evident that the Department of the Army had selected its top-flight officers as speakers for the Industry-Army Conference.

A cocktail party was held at International House from 5:30 to 7:00 which was attended by most of the Army and Industrial representatives and gave everyone a chance to meet the guests on an even footing. In its particular field, this formation was as successful as the "off the record" session in the afternoon.

The finale of the Conference was the banquet attended by the military and industrial representatives. All of the top military representatives at the Conference were presented with keys to the City of New Orleans by Mayor de Lesseps S. Morrison.

*Colonel MacDonald represented the U.S. Coast Artillery Association at the fourth annual Industry-Army Conference at New Orleans on February 27.

AAA Instruction Teams Set For June

Progress is reported on the implementation of the AAA technical instruction teams which are now undergoing a course of training at the Antiaircraft Artillery and Guided Missiles Center at Fort Bliss, Texas. (ANTIAIRCRAFT JOURNAL, September-October 1949, page 19.)

Schedules are being prepared for the employment of these instructional units which will tour the six armies in the continental United States, and the overseas commands.

It is expected that the teams will be operational in the latter part of June and will tour AAA installations of the Regular Army as well as summer training sites of the Organized Reserve and National Guard.

The Army In Civil Defense*

By Lieutenant Colonel L. H. O. Pugh, British Army

Recently the British Minister of Defense stated in Parliament that, to the extent that any military offensive operations would permit, the Army would provide mobile columns, drawn from field formations stationed in this country, as a reserve to the Civil Defense Services.

This statement raises many controversial points. Clarity of thought is necessary to place the Army's task of providing assistance to the Civil Defense Services in its correct perspective.

The role of the field army in war is to fight, either in this country to repel and destroy invaders, or overseas. For these tasks, it must be trained. This raises the question as to the extent to which the demands of civil defense may be allowed to interfere with its training. Further, at what stage are field army formations to be committed in their reserve capacity to assist the Civil Defense Services? The relation of the operational role of field army formations to their civil defense responsibilities must be determined.

In the opening stages of the next war, the nation will be faced with the winning of the air battle over this country. On its successful conclusion will depend the continued existence of the nation's life. It will be a "fight for survival" and will demand the maximum effort from all available resources. In this case, there is no question that for the Army the task of assisting the Civil Defense Services will take priority over all except that of repelling invasion.

This stage having been overcome successfully, more "normal" conditions will prevail. Appreciation of the local factors alone will now determine the stage at which the mobile reserve provided by the Army should be deployed in support of the Civil Defense Services. It is fundamental that the latter are responsible for carrying out civil defense measures themselves. Hence, in its capacity as a reserve, the Army should only be deployed when the situation is in danger of getting out of control of the local civil defense authorities or, due to a major disaster, is already beyond their control. The danger lies in calling the Army too soon and too often. A reserve should not be committed until the situation demands it. The Civil Defense Services should regard assistance from the Army in this light and demand it only when imperative.

In direct conflict with this principle is the obvious advantage of using the Army at an early stage and thus bringing about the restoration of the local situation sooner than would occur were the civil defense organization to rely solely on its own efforts. In the opinion of the public, delay in calling in the Army will appear inexcusable. It will be bad for morale, and restoration of public morale is of primary importance. A further consideration is that the early use of field formations will make it possible to release them earlier.

These factors have to be considered in relation to the operational role of the field army and its training requirements. The decision as to when the situation in a target area demands the deployment of a field army formation in its capacity as a reserve to the local Civil Defense Services, and from where this field army formation is to be drawn, must be made at a high level. It will be a joint decision made by the superior military and civil defense commanders.

The amount of assistance which the Army can provide for civil defense must be considered if this problem is to be seen in its correct proportions. The basic unit to be used is the brigade group, and more than one will undoubtedly be required in any particular situation. Of the total number of men and vehicles available, a proportion will be required for the administration of the troops themselves. Civil defense tasks are expensive in men. The total effort of a brigade group will be swallowed up with little to show in any town.

The greatest attribute of a military formation is that it is an organized body and has the communications to exercise control. It is a cardinal principle that soldiers should be concentrated under their own commanders and not dispersed in "penny packets." This holds true in civil defense as much as in any military operation. The opportunities for dispersion are, however, greater.

Training

The training of the soldier is, in general, directed toward making him proficient in battle. This requires a long and involved period of training, leaving little time for any additional training in civil defense. The tasks he may be called upon to perform in civil defense should therefore be related to what is taught in his military training. Many of these will be carried out under the direction of the police, civil defense officials, and civilian technical experts. They will be such tasks as the reconnaissance of "blitzed" areas, the clearance of debris from essential communications routes, elementary rescue, the rendering of first aid and immediate medical treatment to casualties, assisting the police in controlling refugees, assisting in the distribution of food and water, and (in the event of complete loss of control by the civil authorities due to a major disaster) assuming temporary control of the area until the arrival of civil replacements.

These are all tasks covered by the normal military training of the soldier. They are of a nontechnical nature and to perform them will require no additional subjects to be taught to the individual soldier. Practice in these tasks will of course be required and so additional training will have to be given to officers and junior leaders.

*Reprinted from March 1950 issue of the *Military Review*.

In the case of these last, the position is different. Commanders will be required to plan and operate in conjunction with the civil defense authorities. In certain cases, they will have to take command of all resources, civil and military, to restore the situation. Junior officers and NCOs will carry out these plans, so they will require training. Civil defense must therefore take its place in the curriculum of training of the Army. The "doctrine" must be disseminated at the school responsible. Tactical exercises without troops must be held in formations and units, and combined civil and military exercises must be carried out. This subject should be included in the normal training of the soldier to the extent desirable in relation to his rank.

Conclusions

The contribution of the Army will be small. It must be applied to the best advantage. Each area likely to be selected by the enemy for an attack will contain one or more targets of industrial or communications importance which are vital to the national economy and prosecution of the war effort. These will demand prior treatment. Their restoration in working order will be essential. Such effort as may be available must be concentrated upon these even at the expense of more humanitarian tasks. Plans should be made jointly by the military and civil authorities to this end.

The implications arising from the decision that field army formations in this country will act as a component of the national civil defense organization are many. They include such controversial matters as command, the responsibility for planning, the allocation of troops, the holding of exercises with the local civil defense authorities, and, most important of all, the production of a doctrine of civil defense.

News and Comment

General Collins Visits Guided Missiles Center

FORT BLISS, TEXAS—"Fort Bliss will play an ever-increasing part as a training center as our Guided Missile program is developed," General J. Lawton Collins, Army Chief of Staff, stated at a press conference during his two-day visit.

Landing at Biggs Field, Feb. 20, the Army Chief of Staff was met by Major General J. L. Homer, Commanding General of Fort Bliss, Brig. Gen. J. D. Balmer, Assistant Commandant of the Antiaircraft and Guided Missiles Branch of The Artillery School, Col. Bryan L. Milburn, Fort Bliss chief of staff, and Brig. Gen. D. W. Hutchison, Commanding General of Biggs Air Force Base.

Stating that the small cut in personnel this year was balanced by the acquisition of new equipment, especially light tanks and sky-sweepers, General Collins declared that the U.S. Army is in better shape than three years ago. On the first day of his visit, the General conferred with General Homer, flew over the Fort Bliss reservation and ranges, held a press conference, and spoke to a selected group of officers and "first three graders" assigned to the post.

The following day, the Army Chief motored to Fort Bliss ranges to see a demonstration of antiaircraft firing and later watched the launching of an "Aerobee" rocket at White Sands Proving Ground. He departed on the evening of Feb. 21 for the return to Washington.

* * *

Fort Bliss Housing Project

Dealing another hard blow in the Army's campaign against the housing shortage, Fort Bliss has erected an additional 54-unit permanent housing project which was completed early in February.

The new project consists of single-family, two-bedroom and three-bedroom homes, 27 of each, located slightly east and north of the Replica of Old Fort Bliss on the Post. This project is a part of the Army's progressive housing plan paid for by annual appropriations as distinguished from the prefabricated housing and Van Horne housing projects which were constructed with nonappropriated funds.

Total cost of the project was $606,347.70, with the housing contract costing $524,213.65 and the utilities contract (including streets) costing $82,134.05. Work on the housing started July 25, 1949.

Constructed of frame stucco in pleasing pastel shades, the houses are the "desert type," with flat roofs forming a slight overhang. They are definitely modern in design with many ingenious conveniences making for comfortable living. All houses have evaporative cooling systems and warm-air heating systems with gas-fire furnaces. Asphalt tile floors the new homes.

General J. Lawton Collins, Chief of Staff, United States Army is shown upon his arrival at Biggs Air Force Base, February 20, for a two-day visit to Fort Bliss. Pictured left to right are: Col. Bryan L. Milburn, Fort Bliss chief of staff; General Collins; Brig. Gen. J. D. Balmer, Assistant Commandant, Antiaircraft and Guided Missiles Branch of The Artillery School, Fort Bliss; Major General J. L. Homer, Commanding General of Fort Bliss; Brig. Gen. Stanley Mickelsen of the Department of Army, plans and operations; and Brig. Gen. D. W. Hutchison, Commanding General of Biggs Air Force Base.

First Armed Forces Day Will Be Observed On May 20

The first Armed Forces Day will be observed throughout the Nation on a community level, on May 20.

The third Saturday in May was selected by Secretary of Defense Louis Johnson, and approved by President Truman, as Armed Forces Day to replace the days formerly observed by the individual services.

In his proclamation, President Truman said that the Armed Forces "as a unified team, are currently performing at home and across the seas tasks vital to the security of the nation and to the establishment of a durable peace" and that it is proper to devote "one day each year to paying tribute" to them.

"I call upon my fellow citizens," said the President, "to display the flag of the United States at their homes on Armed Forces Day, to participate in exercises expressive of our recognition of the skill, gallantry and uncompromising devotion to duty characteristic of the Armed Forces in the carrying out of their missions."

Community observances, locally sponsored, will mark the 1950 recognition and appreciation day for the armed services. "Teamed for Defense" has been designated the official slogan for the day.

Familiarization of the public with the state of the nation's defense will be emphasized.

Troop and equipment participation will be provided to as many communities as possible. The national allocation of Naval vessels, plus certain types of aircraft and airborne troops, will be made to assure participation of personnel and equipment in as many cities as possible.

Reserve forces and civilian components will be encouraged to participate actively in observance of the day. The Department of Defense will seek assistance from national headquarters of leading civic, veterans, women's, labor, and religious organizations requesting their endorsement of the occasion and fostering local participation by member chapters, clubs, and posts.

In response to inquiries, the Department of Defense announced that no national organization has been designated as the single sponsor of Armed Forces Day, 20 May.

In past observances of individual service days, national sponsorship was limited to one organization for each day. With the unification of all service days into a single Armed Forces Day, it was felt that sponsoring organizations should not be limited, but that all organizations that wished to participate should have opportunity to do so at the community level.

Many varied types of civic, veterans, fraternal, religious, women's, and business groups will join locally in sponsoring this first observance of Armed Forces Day. These organizations, by coordinating their combined efforts through local Armed Forces Day Project Officers, are planning parades, banquets, balls, luncheon and dinner meetings, mass meetings, open houses at military installations, and other types of celebrations.

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Guard Units Reorganized

The following National Guard, CAC, units have been federally recognized since the last issue of the JOURNAL:

Delaware:
- Battery A, 193d AAA Gun Battalion, Dover.

Florida:
- Battery B, 712th AAA Gun Battalion, Fort Myers.

Kansas:
- Battery C, 135th AAA AW Battalion, Colby.

Michigan:
- Battery B, 593d AAA AW Battalion, Iron River.
- Battery C, 593d AAA AW Battalion, Baraga.

North Carolina:
- Battery C, 725th AAA AW Battalion, Bladenboro.

Wisconsin:
- Battery A, 132d AAA AW Battalion, Port Washington.

THE REASON WHY

It is axiomatic by now that the American soldier, if you want to get the best results from him, must know why a thing needs to be done. Then he will do it better, faster and more willingly than any soldier in the world. Baron von Steuben learned this when he came to this country to help our Revolutionary forces, and he described this unique quality in a letter home in which he wrote: "In the first place, the genius of this nation is not in the least to be compared with that of the Prussians, Austrians or French. You say to your soldier, 'Do this,' and he doeth it; but I am obliged to say, 'This is the reason why you ought to do that,' and then he does it." We try to tell our soldiers "why," as well as what, when, where and how.

This constant encouragement to our soldiers to think for themselves goes hand in hand with our recognition of the soldier's right to a sense of personal dignity. The whole philosophy of the Army's postwar training program is based on the human approach on the recognition and protection of the dignity of the individual.—*The Honorable Gordon Gray, Secretary of the Army.*

COAST ARTILLERY ORDERS

DA and AF Special Orders Covering January 1 through February 28, 1950. Promotions and Demotions not included.

Colonels

Burgess, George R., to 6th Army 6516th ASU, Wash ORC Instr Gp, Seattle, Wash.
Griffin, W. E. to Ryukyus Comd, Okinawa.
Harrington, John H., to Hq Sixth Army Presidio of San Francisco, Calif.
Madison, J. H., to Third Army 3244th ASU ROTC, The Citadel, Charleston, S. C.
Mitchell, J. D., to EUCOM, Bremerhaven, Germany.
Nelson, Ola A., to US Army Alaska, Ft Richardson, Alaska.
Rothgeb, C. E., to Ryukyus Comd, Okinawa.
Tarrant, L. K., to US Army Alaska, Ft Richardson, Alaska.
Tischbein, Carl F., to Office Secy of Def, Wash, D. C.
Wortman, Volney W., to Third Army 3501st ASU, Oliver GH, Augusta, Ga.

Lieutenant Colonels

Alba, B. M., to Sixth Army Pers Cen, Cp Stoneman, Calif.
Blumenfeld, Charles H., to 5th AAA AW Bn, Ft Sheridan, Ill.
Bradley, Cecil U., to USA Gp, Amr. Mission for Aid to Greece, Athens.
Conell, J. C., to OC of S, Wash, D. C.
Connor, R. T., to First Army 1243d ASU NJ Instr Gp, Newark, N. J.
Cummings, Lawrence E., to 6th Army 6513th ASU, Calif NG Instr Gp, Sacramento, Calif.
Defrees, Lindsay J., to OC of S, Wash, D. C.
Hawthorne, William B., to Hq Sixth Army, Presidio of San Francisco, Calif.
Holt, R. H., to Ryukyus Comd, Okinawa.
Johnson, B. H., to Sixth Army 6500th ASU Northern Sub Hq, Vancouver Bks, Wash.
Joseph, Henry B., to 6th Army 6513th ASU Calif NG Instr Gp, Sacramento, Calif.
Kauffman, R. K., to Far East Comd, Yokohama, Japan.
Lewis, Hubert D., to 68th AAA Gp, Ft Ord, Calif.
May, S., to Ryukyus Comd, Okinawa.
Moorman, Richard R., to Far East Comd, Yokohama, Japan.
Murrey, C. T., to OC of S, Wash, D. C.
Rawls, J. W., to OC of S, Wash, D. C.
Robbins, A. D., to Hq Second Army, Ft Meade, Md.
Rutz, Lee J., to Stu Det CIC Cen, Cp Holabird, Md.
Spackman, J. L., to Far East Comd, Yokohama, Japan.
Stewart, Leslie M., to US Army Alaska, Ft Richardson, Alaska.
Wilkerson, J. C., to Far East Comd, Yokohama, Japan.
Wollaston, Pennock H., to Hq Army Scty Agency, Wash, D. C.

Majors

Benit, D. J., to Ryukyus Comd, Okinawa.
Brown, H. C., to Ryukyus Comd, Okinawa.
Burt, Russell E., to First Army 1129th ASU, N.H. ORC Instr Gp, Manchester, N. H.
Caulfield, T. D., to Fourth Army 4052d ASU AFF Bd No 4, Ft. Bliss, Tex.
Crowell, William H., to TRUST, Trieste.
Harmon, P. A., to Far East Comd, Yokohama, Japan.
Hertz, Clyde E., to 29th Mil Govt Co., Ft Bragg, N. C.
Johnson, Charles W., to Third Army 3440th ASU, Det No 1 ORC Instr Gp, Ga. Mil Dist, Atlanta, Ga.
Kirk, Lewis H., Jr., to Office Secy of Def, Wash, D. C.
Lee, Daniel P., to Ryukyus Comd, Okinawa.
Light L. L., to Far East Comd, Yokohama, Japan.
Manchester, R. E., to First A 1129th ASU N.H. ORC Instr Gp, Laconia, N. H.
Rae, Dudley O., to USA Gp Amer. Mission for aid to Greece, Athens.
Saberhagen, Harold A., to Hq Fifth Army, Chicago, Ill.
Terrible, V. T., to Far East Comd, Yokohama, Japan.
Terry, Frank E., to US Army Alaska, Ft Richardson, Alaska.
Wilcox, N. G., to Far East Comd, Yokohama, Japan.
Wills, H. P., to Ryukyus Comd, Okinawa.

Captains

Baray, A. A., to 11th AAA AW Bn, Ft Lewis, Wash.
Bookter, E. F., to Ryukyus Comd, Okinawa.
Cruickshank, W. C., to Hq Fifth Army, Chicago, Ill.
Dann, Arthur J., to Hq Army Scty Agency, Wash, D. C.
Dodson, John H., to OC of S, Wash, D. C.
Eichler, Thos. O., to 1st GM Regt, Ft Bliss, Tex.
Gaunt, R. W., to Marianas-Bonins Comd, Guam.
Gentle, J. E., to Far East Comd, Yokohama, Japan.
Gilman, B. A., to First Army 1202d ASU Det No 1, USA and USAF Rctg Sta, Albany, N. Y.
Gorgol, D. O., to 31st AAA Brig, Ft Lewis, Wash.
Hancock, W. A., to Hq Sixth Army, San Francisco, Calif.
Harris, W. T., to Far East Comd, Yokohama, Japan.
Hartwig, Harvey H., to US Army Alaska, Ft Richardson, Alaska.
Hasper, John E., to Far East Comd, Yokohama, Japan.
Hodge, William L., to 7689th Hq Gp USFA, Salzburg, Germany.
Hutchins, Leroy W., to 113th CIC Det Fifth Army, Chicago, Ill.
Josephson, S. W., to AFSWP, Wash, D. C.
Kasler, Charles L., to OC of S, Wash, D. C.
Kemper, George E., to Stu Det Arty Sch, Ft Sill, Okla.
Levine, A., 525th Mil Sv Co, V Cp, Ft Bragg, N. C.
McKinnon, E. F., to 82d AAA AW Bn, Ft Bragg, N. C.
Milner, George L., to 19th AAA Gp, Ft Meade, Md.
Neff, J. M., to Office QM Gen, Wash, D. C.
Olsen, B. G., to 11th Abn Div, Cp Campbell, Ky.
Sims, L. H., to 62d AAA AW Bn Cp Hood, Tex.
Stappler, F., to 7689th Hq Gp USFA, Salzburg, Germany.
Vandervort, Charles E., to 11th Abn Div, Cp Campbell, Ky.
Washbourne, K. V., to 31st AAA Brig, Ft Baker, Calif.
Waters, F. D., to Ryukyus Comd, Okinawa.
Wilson, David J., to 109th CIC Det Second Army, Ft Meade, Md.

First Lieutenants

Ashm, Alvin, to 88th Abn, AAA Bn, Cp Campbell, Ky.
Boone, Boyce J., to 68th AAA Gp, Ft Ord, Calif.
Clark, G. M., to Far East Comd, Yokohama, Japan.
Covington, C. W., to Stu Det Arty School, Ft Sill, Okla.
Cravens, J. J., to Far East Comd, Yokohama, Japan.
Devine, John A., to Stu Det Arty Sch, Ft Sill, Okla.
Dwyer, J. W., to 75th AAA Gun Bn, Ft Meade, Md.
Farris, Philip A., to 88th Abn AA Bn, Cp Campbell, Ky.
Gardner, W. C., to First A 1209th ASU, Pine Camp, N. Y.
Gillespie, Bryce, to Stu Det QM Sch, Cp Lee, Va.
Hamscher, Geo. M., to Stu Det AAA & GM Br Arty Sch, Ft Bliss, Tex.
Harty, P. H., to Ryukyus Comd, Okinawa.
Hopkins, R. L., to 70th AAA Gun Bn, Ft Meade, Md.
Hottle, F. C., to 62d AAA AW Bn, Cp Hood, Tex.
Hutcherson, K. R., to 12th Armd Inf Bn, Cp Hood, Tex.
Johns, Cecil, to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Johnson, Walter A., to Stu Det Arty Sch, Ft Sill, Okla.
Lovett, F. P., Jr., to Stu Det CIC Cen, Cp Holabird, Md.
McGrane, John A., to Stu Det Arty Sch, Ft Sill, Okla.
McMillan, W. Z., to 43d Armd Inf Bn, Ft Sill, Okla.
Machristie, Andrew, to 19th AAA Gp, Ft Meade, Md.
Maliko, J., to 19th AAA Gp, Ft. Meade, Md.
Mintz, Fred, to Far East Comd, Yokohama, Japan.
Muench, P. F., to Far East Comd, Yokohama, Japan.
Norton, Herbert A., to Stu Det QM Sch, Cp Lee, Va.
Parker, W. R., to 88th Abn AA Bn, Cp Campbell, Ky.
Pinkett, Maslin F., to Stu Det Arty Sch, Ft Sill, Okla.
Range, A. R., to 108th CIC Det, White Plains, N. Y.
Serpe, Anthony D., to Stu Det Arty Sch, Ft Sill, Okla.
Stevens, R. R., to 3d Armd Div, Ft Knox, Ky.
Swan, V. B., to 70th AAA Gun Bn, Ft Meade, Md.
Vranish, Robert L., to 88th Abn AA Bn, Cp Campbell, Ky.
Week, Lawrence J., to Stu Det Arty Sch, Ft Sill, Okla.
Wells, D. C., to 68th AAA Gp, Ft Ord, Calif.

Second Lieutenants

Allen, E. G., to 501st AAA Gun Bn, Ft Lewis, Wash.
Anderson, J. A., to 68th AAA Gun Bn, Ft Lewis, Wash.
Anthony, H. L., to 19th AAA Gp, Ft Meade, Md.
Armstrong, A. J., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Bass, B. F., to 78th AAA Gun Bn, Ft Lewis, Wash.
Bell, A. D., to 19th AAA Gp, Ft Meade, Md.
Bluhm, J. L., to 68th AAA Gun Bn, Ft Lewis, Wash.
Bolton, Buford T., to 68th AAA Gp, Ft Ord, Calif.
Borden, H. W., to 504th AAA Gun Bn, Ft Custer, Mich.
Bradshaw, N. F., to 78th AAA Gun Bn, Ft Lewis, Wash.
Brantley, Ed, Jr., to US Army Alaska, Ft Richardson, Alaska.
Brewton, L. K., to Far East Comd, Yokohama, Japan.

Carroll, D. D., to 504th AAA Gun Bn, Ft Custer, Mich.
Cartier, W. A., to Ft Lewis, Wash.
Carter, Dennis E., to 68th AAA Gp, Ft Ord, Calif.
Clark, W. L., to 88th Abn Bn, Cp Campbell, Ky.
Cliburn, Cecil D., to US Army Alaska, Ft Richardson, Alaska.
Cochran, W. L., to 68th AAA Gp, Ft Ord, Calif.
Conrad, E. E., to 504th AAA Gun Bn, Ft Custer, Mich.
Dawson, C. L., to 19th AAA Gp, Ft Meade, Md.
Dennen, Chas. A., to Far East Comd, Yokohama, Japan.
Diffenderfer, Gilbert D., to Far East Comd, Yokohama, Japan.
Dixon, R. M., to 11th AAA AW Bn, Ft Lewis, Wash.
Doss, W. C., Jr., to 19th AAA Gp, Ft Meade, Md.
Dunaway, E. G., to 19th AAA Gp, Ft Meade, Md.
Engle, R. J., to 518th AAA Gun Bn, Ft Lewis, Wash.
Engstrom, J. G., to 518th AAA Gun Bn, Ft Lewis, Wash.
Feinberg, J. G., to 518th AAA Gun Bn, Ft Lewis, Wash.
Franklin, G. I., to 19th AAA Gp, Ft Meade, Md.
Fredin, H. R., to 19th AAA Gp, Ft Meade, Md.
Fujimoto, Yoshito, to A Lang Sch, Presidio of Monterey, Calif.
Gaynor, R. L., to 5th AAA AW Bn, Ft Sheridan, Ill.
Glommen, H. H., to 8th AAA AW Bn, Ft Custer, Mich.
Guillerman, R. G., to 19th AAA Gp, Ft Meade, Md.
Hair, G. M., to 5th AAA AW Bn, Ft Sheridan, Ill.
Higgs, A. J., to 30th AAA AW Bn, Ft Custer, Mich.
Hill, I. F., to 11th AAA AW Bn, Ft Lewis, Wash.
Hinkle, Lonnie J., to Far East Comd, Yokohama, Japan.
Hoffmann, W. A., to 30th AAA AW Bn, Ft Custer, Mich.
Holmes, G. J., to 519th AAA Gun Bn, Ft Lewis, Wash.
Hooper, G. J., to Ryukyus Comd, Okinawa.
Hubbard, E. A., to 68th AAA Gp, Ft Ord, Calif.
Irwin, J. S., to 68th AAA Gp, Ft Ord, Calif.
Johnson, J. A., to 78th AAA Gun Bn, Ft Lewis, Wash.
Kaminer, H. O., to Ryukyus Comd, Okinawa.
Kelly, Chester B., to Ryukyus Comd, Okinawa.
Kelly, T. L., to Ryukyus Comd, Okinawa.
Kotch, J. R., to 30th AAA AW Bn, Ft Custer, Mich.
Landsman, G. D., to 68th AAA Gp, Ft Ord, Calif.
Lavendar, Paul W., to 319th FA Bn, 82d Abn Div, Ft Bragg, N. C.
Lehr, G. F., to 68th AAA Gp, Ft Ord, Calif.
Lyons, Donn B., to Stu Det Arty Sch, Ft Sill, Okla.
McKinley, R. J., to 519th AAA Gun Bn, Ft Lewis, Wash.
McLean-Kennedy, D. S., to 15th AAA AW Bn, Ft Lewis, Wash.
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100 cards with new plate	$6.75
100 cards with your plate	2.70
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100 sets (7 lines only)	$23.40
100 sets (9 lines only)	25.20
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100 sets (4 lines only)	$9.00
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